# System Components
# SGI™ Origin™ 3000 and
# SGI™ SNIA 3000 Server Series

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# Record of Revision

| Version | Description |
|---|---|
| 001 | July 2000<br>Original printing. |
| 002 | December 2000<br>This revision includes the following technical changes:<br>• Added a note about the 6- and 8-port R bricks<br>• Removed two troughs from the 512-processor system diagram<br>• Added InfiniteReality as a supported board set of the Silicon Graphics Onyx3 graphics system<br>• Removed all references of the G brick connecting to a P brick<br>• Added text that specifies that the utility shelf resides in compute racks only<br>• Reduced the number of power supplies in the I/O rack power bay from 5 to 4 |
| 00x | ?? 2001<br>This revision adds the SGI SNIA 3000 series server information. |

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*Chapter 1*

# Racks

**Note:** For information that applies to both the SGI Origin 3000 and SGI SNIA 3000 series servers, the name 3000 series servers is used throughout this document.

The 3000 series servers are modular systems that allow for flexible system configurations. To enable modular configurations, the system components are packaged into standard 19-inch rackmount subassemblies that are referred to as bricks. A system can consist of processor/memory bricks, router bricks, I/O bricks, disk bricks, and graphics bricks that are mounted in one or more racks.

The most basic 3000 series server contains 2 processors that reside in one short rack. The largest Origin 3000 series server contains 512 processors that reside in 16 compute racks (refer to Figure 1-1). The 3000 series servers can be clustered to increase the number of processors; for example, the Origin 3000 series server can be clustered to increase the number of processors from 512 to thousands of processors.

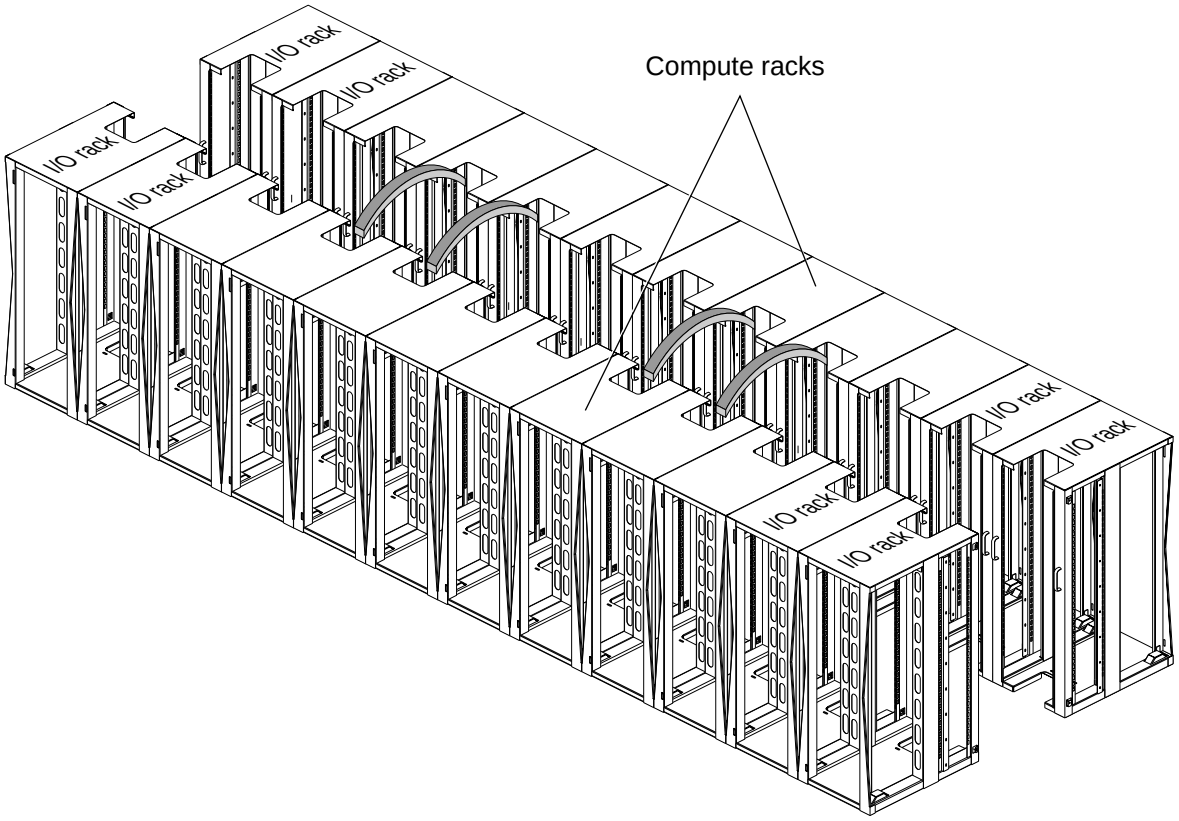



**Figure 1-1** SGI Origin 3000 Series 512-processor Server (16 Compute Racks and 8 I/O Racks)

The 3000 series servers support two rack types: a short rack and a tall rack. Both rack types use 19-in. mounting rails to support the bricks within the rack. For example, two parallel L-shaped mounting rails support one brick within the rack: one rail is secured to the left side of the rack and the other rail is secured to the right side of the rack. The two rails are separated by 19 inches of horizontal space (refer to Figure 1-2).

The bottom portion of the L-shaped rail creates a ledge. During insertion and removal, the brick slides along the two parallel ledges. Once the brick is inserted into the rack, the two ledges support the brick and the brick is fastened to the rack with screws.

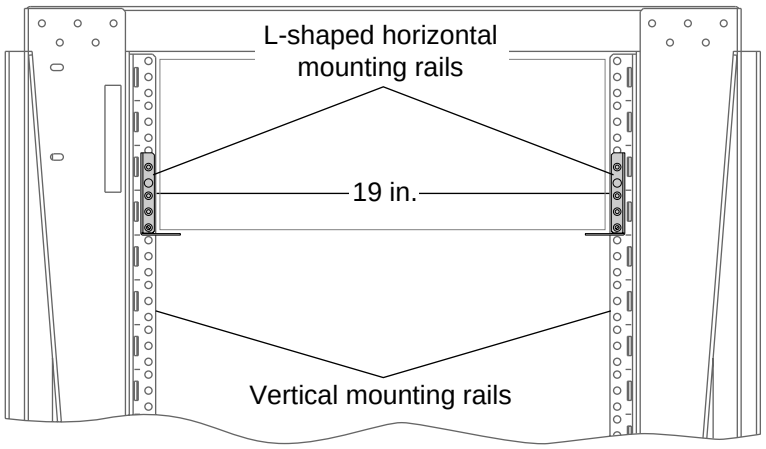



**Figure 1-2** Mounting Rails

## 1.1 Short Rack

The SGI Origin 3200 and SGI SNIA 3200 servers use one short rack (refer to Figure 1-3), which is a 17-unit (U) rack that contains standard 19-in. mounting rails.

**Note:** One U is 1.75 in.

Table 1-1 lists the specifications of the short rack.

**Table 1-1** Short Rack Specifications (with skins)

| Characteristic | Specification |
|---|---|
| Height | 36 in. (914.40 mm) |
| Width | 26 in. (660.40 mm) |
| Depth | 41 in. (1,041.40 mm) |
| Weight (maximum) | 500 lbs (225.00 kg) |
| Shipping weight (maximum) | 600 lbs (270.00 kg) |

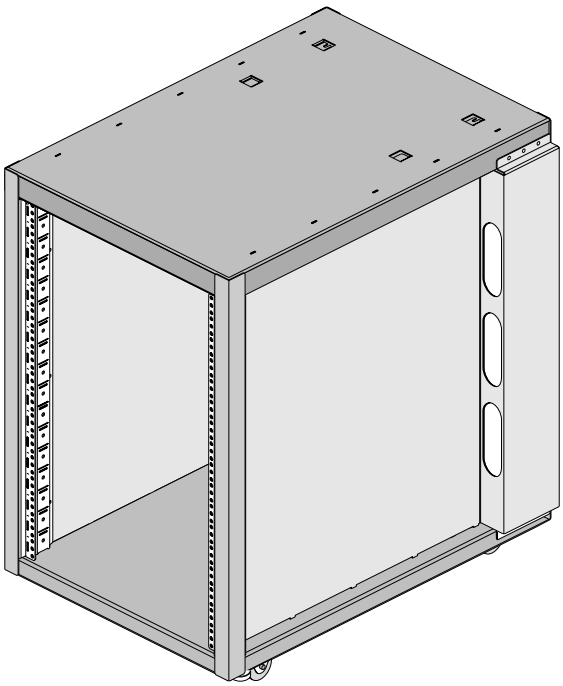


**Figure 1-3** Front View of Short Rack

A short rack has a front door and a rear door; both doors have keylocks that prevent unauthorized access of the system.

**Note:** The LEDs of the brick controllers are visible with the doors closed.

This rack also has a cable entry / exit area at the bottom of the rack. Cable management occurs in the rear of the rack.

The rack is mounted on four casters, two of which are swivel castors. The castors allow the rack to be rolled out of a shipping crate and to its placement at the customer site.

The base of the rack has leveling pads, a ground strap, and seismic tie-downs.

## 1.2 Tall Rack

The tall rack is a 39-U rack that contains 19-in. mounting rails and SGI design features that handle the cable management and shipping requirements (for example, height requirements) (refer to Figure 1-4). The tall rack is used for compute racks, I/O racks, the SGI Onyx3000 graphics system, and JBOD disk storage.

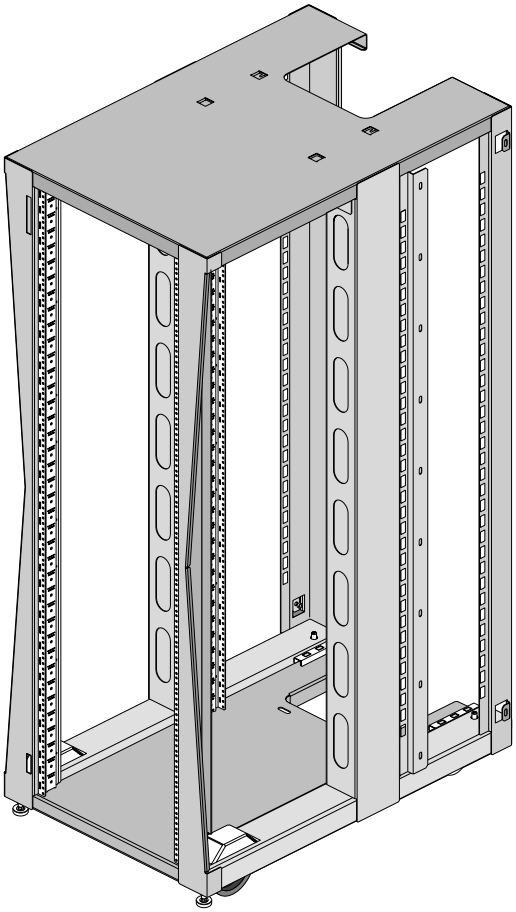


**Figure 1-4** Front View of Tall Rack

Table 1-2 lists the specifications of the tall rack.

**Table 1-2** Tall Rack Specifications

| Characteristic | Specification |
|---|---|
| Height | 74.25 in. (1,880 mm) |
| Width | 30.00 in. (762 mm) |
| Depth | 50.00 in. (1,270 mm) |
| Weight (maximum) | 1,600 lbs. (726 kg) |
| Shipping weight (maximum) | 1,800 lbs. (816 kg) |

A tall rack has a front door and a rear door; both doors have keylocks that prevent unauthorized access of the system.

**Note:** The LEDs of the brick controllers are visible with the doors closed.

This rack also has cable entry / exit areas at the top, bottom, and sides of the rack (refer to Figure 1-5). I / O and power cables pass through the bottom of the rack. NUMAlink 3 cables pass through the top and sides of the rack. Cable management occurs in the rear of the rack.

The rack is mounted on four casters, two of which are swivel castors. The castors allow the rack to be rolled out of a shipping crate and to its placement at the customer site.

The base of the rack has leveling pads, a ground strap, and seismic tie-downs.

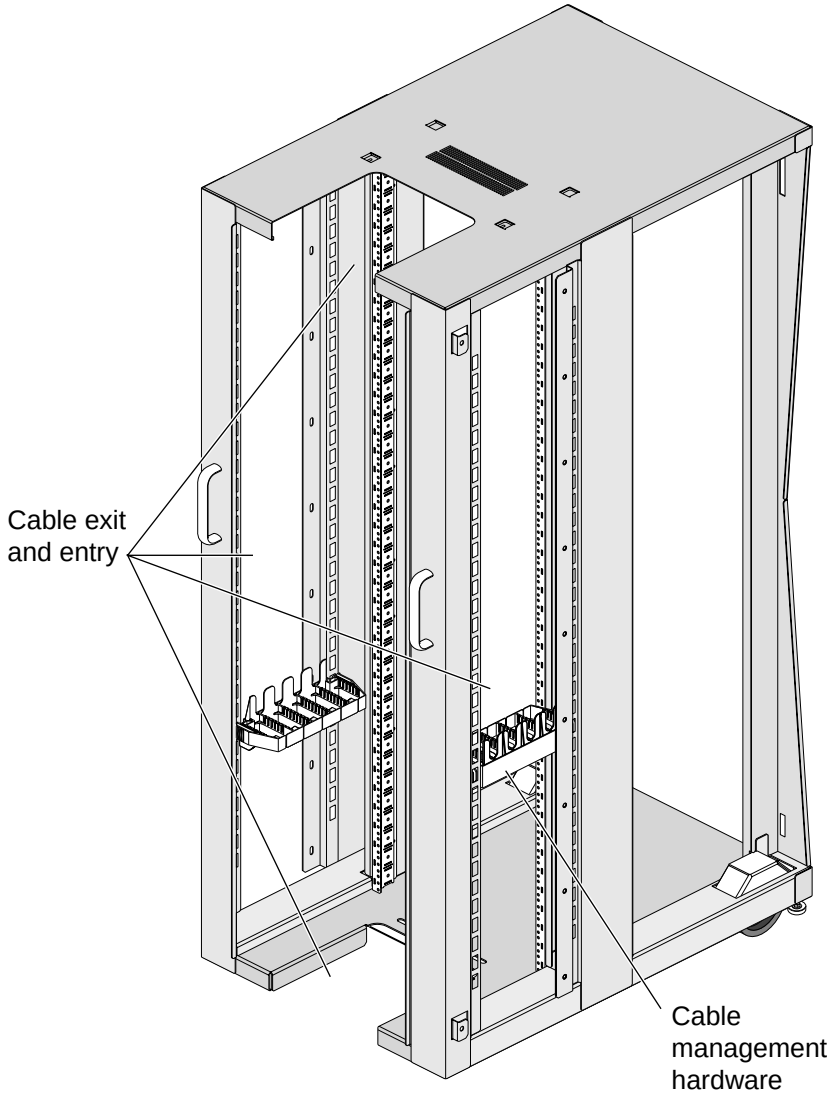



**Figure 1-5** Rear View of Tall Rack

*Chapter 2*

# Bricks

**Note:** For information that applies to both the SGI Origin 3000 and SGI SNIA 3000 series servers, the name 3000 series servers is used throughout this document.

Bricks are the modular components of the 3000 server series.

There are seven types of bricks, all of which install at the front of the rack. The SGI Origin 3000 series server supports all seven brick types. The SGI SNIA 3000 series server only supports the C, R, I, P, and D bricks.

- C bricks - Provide the compute functionality for the system.

  **Note:** The Origin 3000 and SNIA 3000 series servers use different C bricks.

- R bricks - Route information between C bricks, either directly or through other R bricks.
- I bricks - Provide the base I/O functions for the system and house PCI cards.
- P bricks - House PCI cards.
- X bricks - Provide four half-height XIO slots that are compatible with the XIO slots of the SGI Origin 2000 server and Silicon Graphics Octane workstation.
- D bricks - House up to 12 disk drives and modules that handle I/O, power, cooling, and operations.
- G bricks - House the InfiniteReality, InfiniteReality2, or InfiniteReality3 board set for the SGI Onyx 3000 graphics system.

## 2.1 C Brick - SGI Origin 3000 Series Server

The C brick provides the compute functionality for the SGI Origin 3000 series server; this brick may also be referred to as a *compute node.*

The C brick requires 3 U of space within the rack (refer to Figure 2-1) and has the specifications that are listed in Table 2-1.

**Table 2-1** Origin 3000 Series C-brick Specifications

| Characteristic | Specification |
|---|---|
| Height | 5.25 in. (133.35 mm) |
| Width | 17.5 in. (444.50 mm) |
| Depth | 27.5 in. (698.50 mm) |
| Weight | 45.0 lb (20.25 kg) |

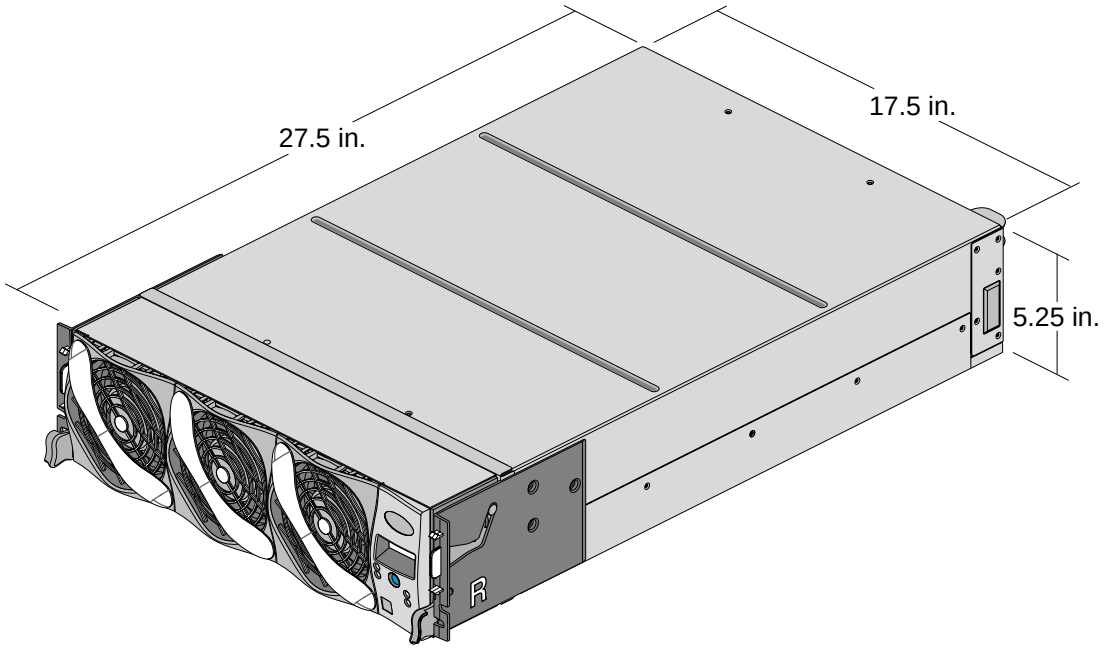



**Figure 2-1** Front View of Origin 3000 Series C Brick

### 2.1.1 Components

The C brick houses a removable logic carrier that slides in and out of the brick (refer to Figure 2-2). The logic carrier contains the following components:

- Processor integrated memory modules (PIMMs)
- Dual-inline memory modules (DIMMs)
- IP35 motherboard
- L1 controller
- Fans

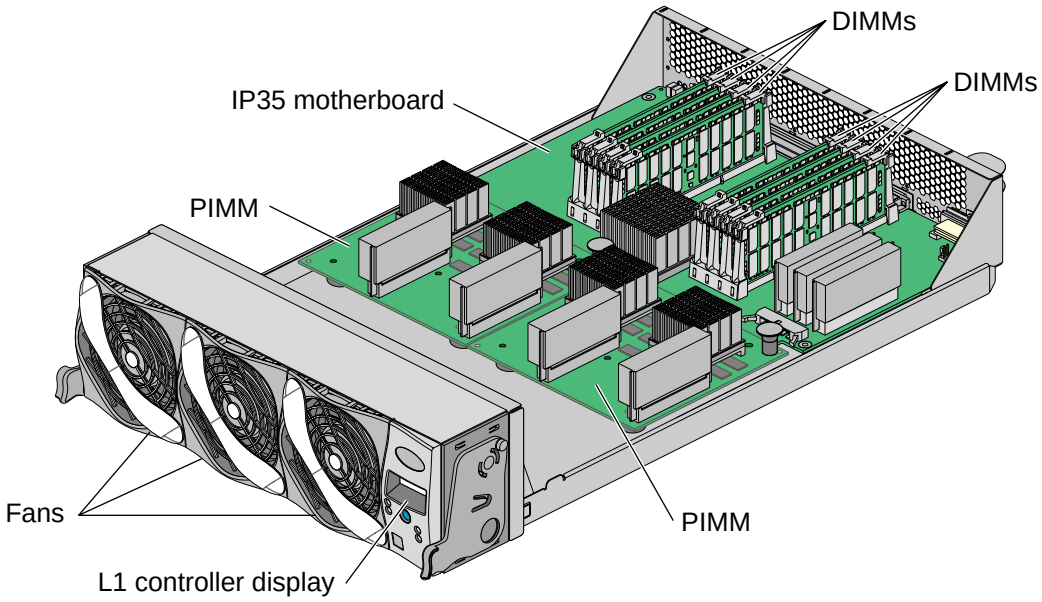



**Figure 2-2** Logic Carrier of Origin 3000 Series C Brick

#### 2.1.1.1 Processor Integrated Memory Modules (PIMMs)

A C brick contains one or two PIMMs (refer to Figure 2-3). Each PIMM contains:

- Two processors
- 4 or 8 Mbytes of secondary cache per processor

  **Note:** The size of the secondary cache depends on the processor type. For example, the MIPS R12000 processor uses a 4-Mbyte cache; the MIPS R12000A processor uses an 8-Mbyte cache.

- Two voltage regulator modules (VRMs) that convert the incoming 48 Vdc to the voltage levels that the PIMM components require:
  - 1.8 Vdc, 30 A
  - 3.3 Vdc, 30 A
- Boundary scan logic (not shown in Figure 2-3)
- Serial ID EEPROM that contains component information
- Inter-integrated circuit bus ($I^2C$) bus for voltage monitoring and control (not shown in Figure 2-3)
- Two 240-pin connectors that connect the PIMM to the IP35 motherboard: one connector is predominantly for processor A and the other connector is predominantly for processor B. Both connectors handle some boundary scan, $I^2C$, and miscellaneous signals.

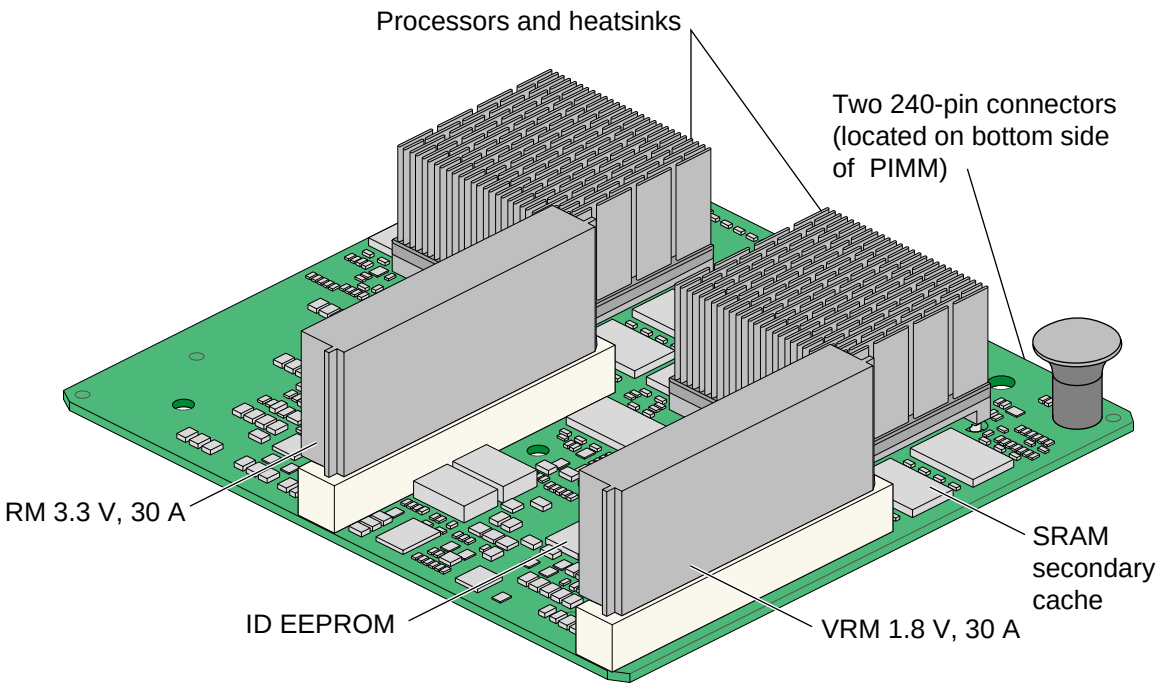



**Figure 2-3** PIMM

#### 2.1.1.2 Dual-inline Memory Modules (DIMMs)

Each C brick can contain up to eight DIMMs: two DIMMs per bank pair of memory. For example, Banks 0 and 1 share two DIMMs, Banks 2 and 3 share two DIMMs, Banks 4 and 5 share two DIMMS, and Banks 6 and 7 share two DIMMs. The DIMMs contain double-data-rate synchronous dynamic random-access memory (DDR SDRAM) chips that compose main and directory memory (refer to Figure 2-4).

There are two types of DIMMs: standard and premium. The two DIMMs are identical with one exception: the premium DIMMs contain additional memory chips. The premium DIMMs are required for SGI 3800 servers that contain more than 128 processors; these systems need more directory memory.

The standard DIMM sizes are 256 Mbytes and 512 Mbytes. The premium DIMMs are also available in 512 Mbytes and 1 Gbyte.

**Note:** You can increase or decrease the size of memory by bank pair (two DIMMs). The two DIMMs that compose a bank pair must be the same size; however, the four bank pairs within a C brick can be different memory sizes.

The DIMMs also have a serial ID EEPROM that contains the part number, date code, and memory chip manufacturer.

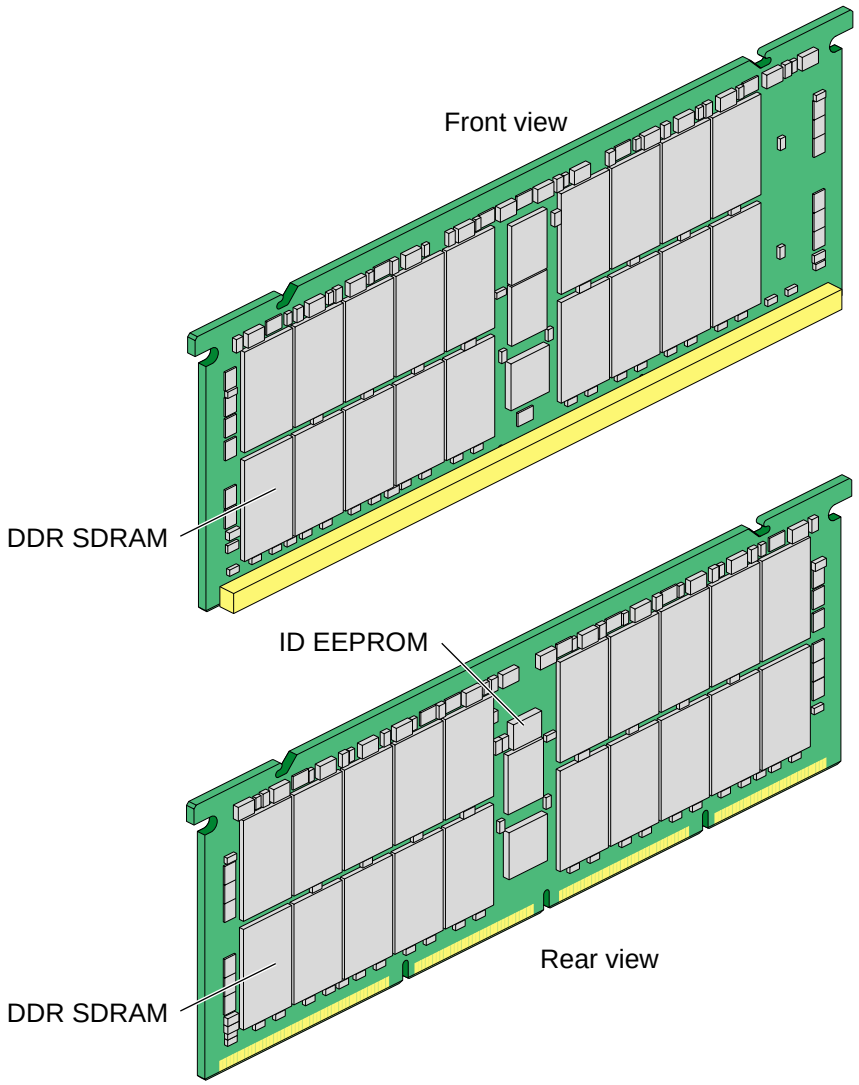



**Figure 2-4** 512-Mbyte DIMM

#### 2.1.1.3 IP35 Motherboard

Figure 2-5 illustrates the IP35 motherboard; it is a half-panel board that contains:

- Eight DIMM sockets
- A hub (also referred to as Bedrock) application-specific integrated circuit (ASIC) that allows communication between the processors, memory, network routers, and I/O devices. The hub also controls all activity within the C brick; for example, error correction and cache coherency.
- L1 controller logic (refer to the orange-colored components in Figure 2-5)
- A serial ID EEPROM that contains component information
- Three 2.5-Vdc, 30-A VRMs (VRMs 1 through 3) that convert the incoming 48 Vdc to the voltage levels that the components require
- Boundary scan logic (not shown in Figure 2-5)
- Ten light-emitting diodes (LEDs)
  - Two NUMAlink 3 LEDs that the L1 controller controls
  - Two Crosstown2 LEDs that the L1 controller controls
  - Four heartbeat LEDs that the hub ASIC controls
  - Two power LEDs: one for 12 Vdc and one for 48 Vdc
- Nine connectors:
  - Four 240-pin PIMM connectors
  - One power connector that inputs 48 Vdc from the power bay
  - One NUMAlink 3 connector that connects the C brick to the NUMAlink 3 interconnect (The NUMAlink 3 interconnect can be an R brick or a C brick if the system does not have an R brick.)
  - One Crosstown2 connector that connects the C brick to an I, P, or X brick
  - One Console connector that connects the C brick to the console
  - One USB port connector that connects the C-brick L1 controller to the rack controller (also referred to as the Level 2 [L2] controller)

    **Note:** The C brick uses the USB port only when the system does not have an R brick.

  You can access the power, NUMAlink 3, Crosstown2, console, and USB port connectors at the rear of the brick (refer to Figure 2-7). On the rear of the C-brick enclosure, the connectors are labeled as follows:

  - Power connector - PWR
  - NUMAlink 3 connector - LINK (NI)
  - Crosstown2 connector - XIO (II)
  - Console connector - CONSOLE
  - USB port - L1 PORT

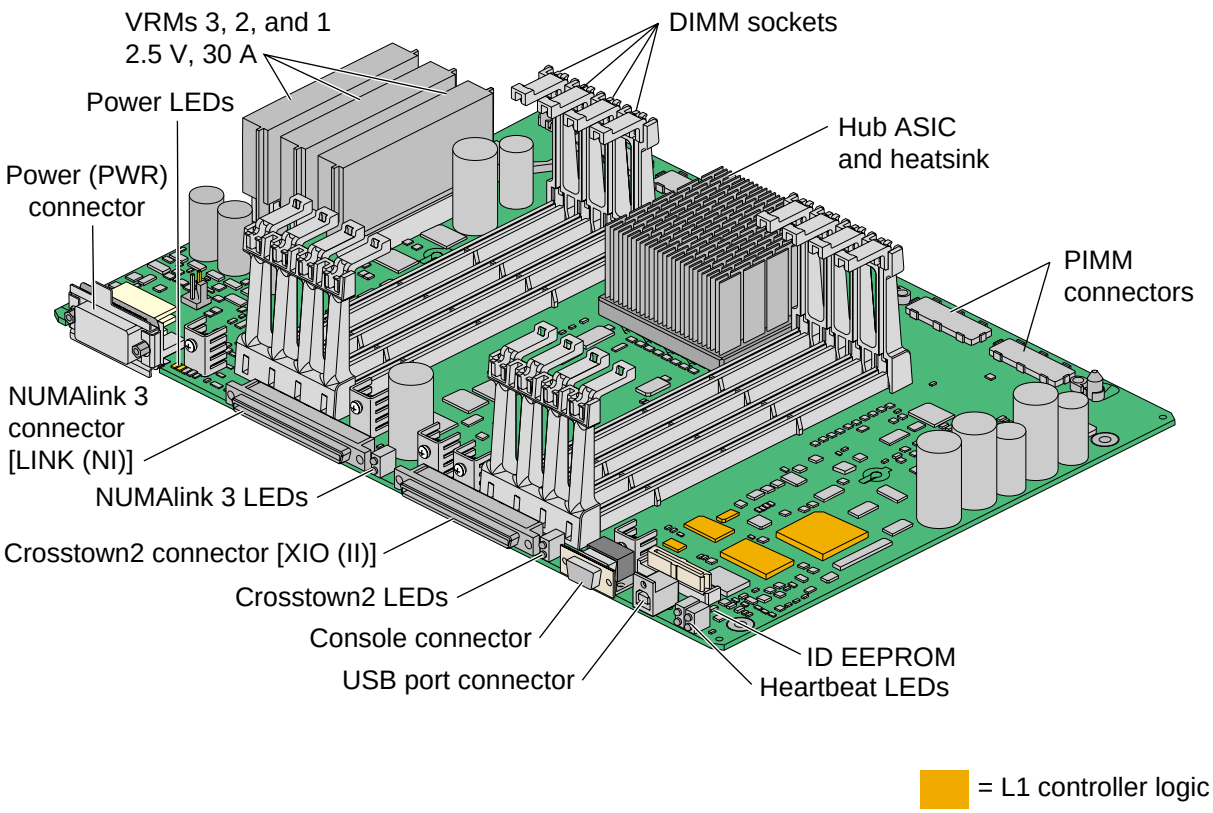



**Figure 2-5** IP35 Motherboard

#### 2.1.1.4 L1 Controller

The L1 controller monitors and controls the environment of the C brick. For example, the L1 controller monitors and controls the following items:

- Fan speed
- Operating temperature
- Voltage margins
- System LEDs

The L1 controller also reads component information from serial ID EEPROMs, provides a console connection, and interfaces with its own 2-line x 12-character liquid crystal display (LCD).

The L1 controller consists of the display, logic components, and a display cable. The display is located at the front of the C brick. The logic components are located on the IP35 motherboard. The cable connects the display to the logic components (refer to Figure 2-6).

For more information about the L1 controller, refer to Chapter 4 of this document or to the *System Controllers* document, publication number 108-0241-001.

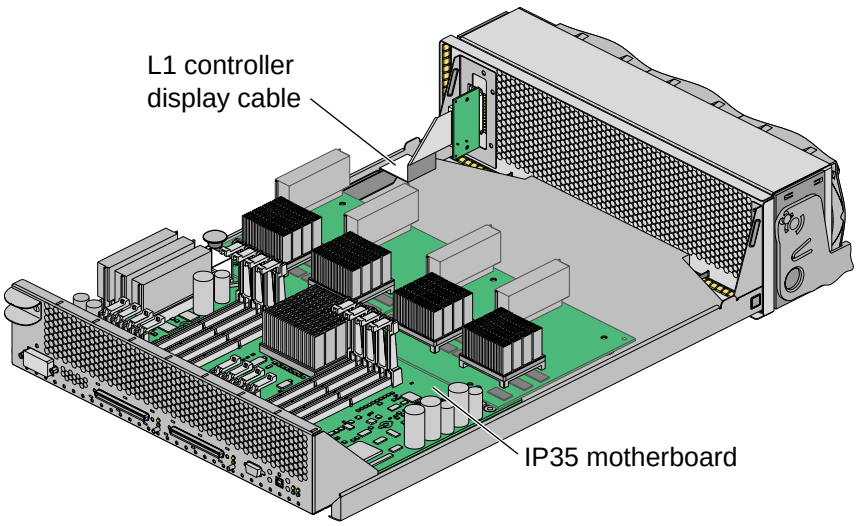



**Figure 2-6** Origin 3000 Series C-brick L1 Controller Display Cable

#### 2.1.1.5 Fans

The C brick is an air-cooled device; three fans, which are located at the front of the C brick, move air from the front of the rack, through the C brick, to the rear of the rack. These fans are N+1 redundant, can be hot swapped, and run at variable speeds.

### 2.1.2 Field Replaceable Units (FRUs)

To perform most maintenance activities on the C brick you must power down the C brick; however, the system can remain powered up. The IRIX operating system allows you to idle the partition that includes the C brick. Once the partition is idled, you can power down the C brick, perform the maintenance activity, power up the C brick, and reconfigure the partition into the system; all of these activities can occur while the operating system is running in the other partitions.

**Note:** You can replace a fan while the C brick is powered up.

The C-brick FRUs include the following components:

- IP35 motherboard
- Processor integrated memory modules (PIMMs)
- Memory DIMMs
- Fans
- Fan-box assembly without fans
- L1 controller display printed circuit assembly (PCA)
- Harness assemblies
- VRMs (1.8 V - 30 A, 2.5 V - 30 A, 3.3 V - 30 A)
- Cable docks
- Lever service
- Rack ears

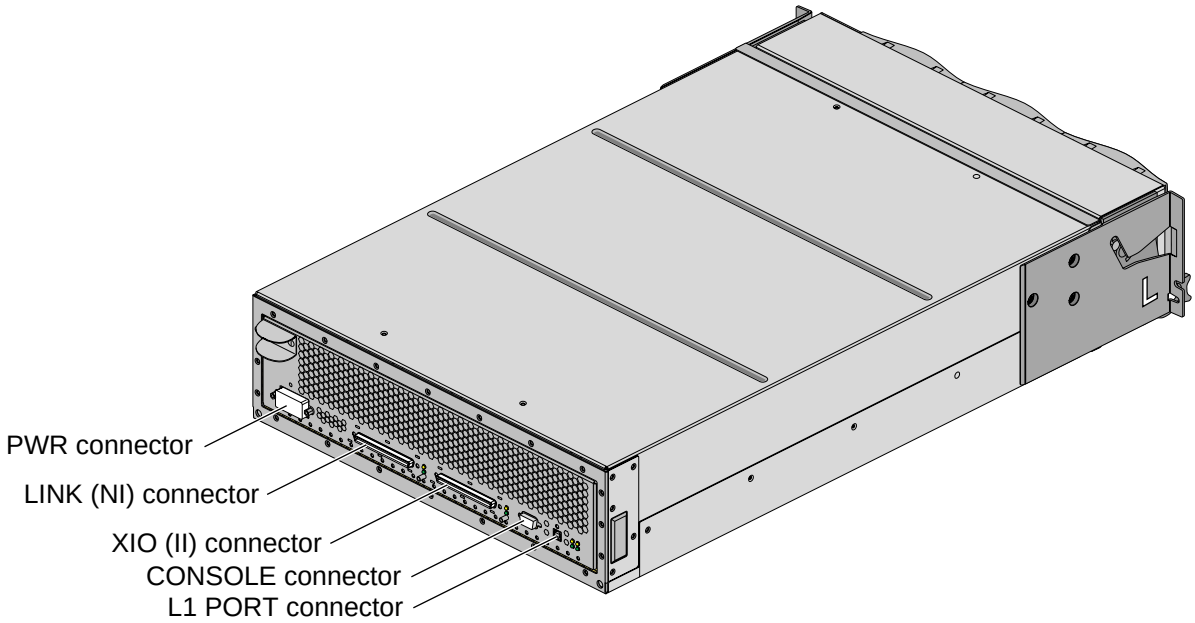



**Figure 2-7** Rear View of Origin 3000 Series C Brick

## 2.2 C Brick - SGI SNIA 3000 Series Server

Like the SGI Origin 3000 series server, the C brick (also referred to as a *compute node)* provides the compute functionality for the SGI SNIA 3000 series server. The the size of the SNIA 3000 C brick (with the exception of weight), the fans, the DIMMs, and the L1 controller are the same as the SGI Origin 3000 C brick. Table 2-2 lists the key differences between the Origin 3000 C brick and the SNIA 3000 C brick.

**Table 2-2** Differences Between the Origin 3000 C Brick and the SNIA 3000 C Brick

| Difference | Description |
|---|---|
| Synergy ASICs | The Synergy ASICs are new components of the SNIA 3000 C brick. These ASICs are the interface between the Itanium processors and the hub ASICs. |
| IP37 board | This board contains all of the SNIA 3000 C-brick logic (for example, processor sockets, power PODs, DIMM slots, hub ASIC, two Synergy ASICs, DC-to-DC converters, L4 cache, boundary scan logic, serial ID EEPROM, $I^2C$ bus, L1 controller logic, LEDs, and connectors).<br>In the Origin 3000 C brick, the C-brick logic components are contained on two board types: IP35 mother boards and PIMMs. An IP35 motherboard contains the DIMM sockets, hub ASIC, L1 controller logic, serial ID EEPROM, VRMs, boundary scan logic, LEDs, and connectors. The PIMMs contain the processors, secondary cache, VRMs, boundary scan logic, serial ID EEPROM, $I^2C$ bus, and two connectors. |
| Weight | The SNIA 3000 C brick is 10 pounds heavier than the Origin 3000 C brick. |

The C brick requires 3 U of space within the rack (refer to Figure 2-8) and has the specifications that are listed in Table 2-3.

**Table 2-3** SNIA 3000 Series C-brick Specifications

| Characteristic | Specification |
|---|---|
| Height | 5.25 in. (133.35 mm) |
| Width | 17.5 in. (444.50 mm) |
| Depth | 27.5 in. (698.50 mm) |
| Weight | 55.0 lb (24.27 kg) |

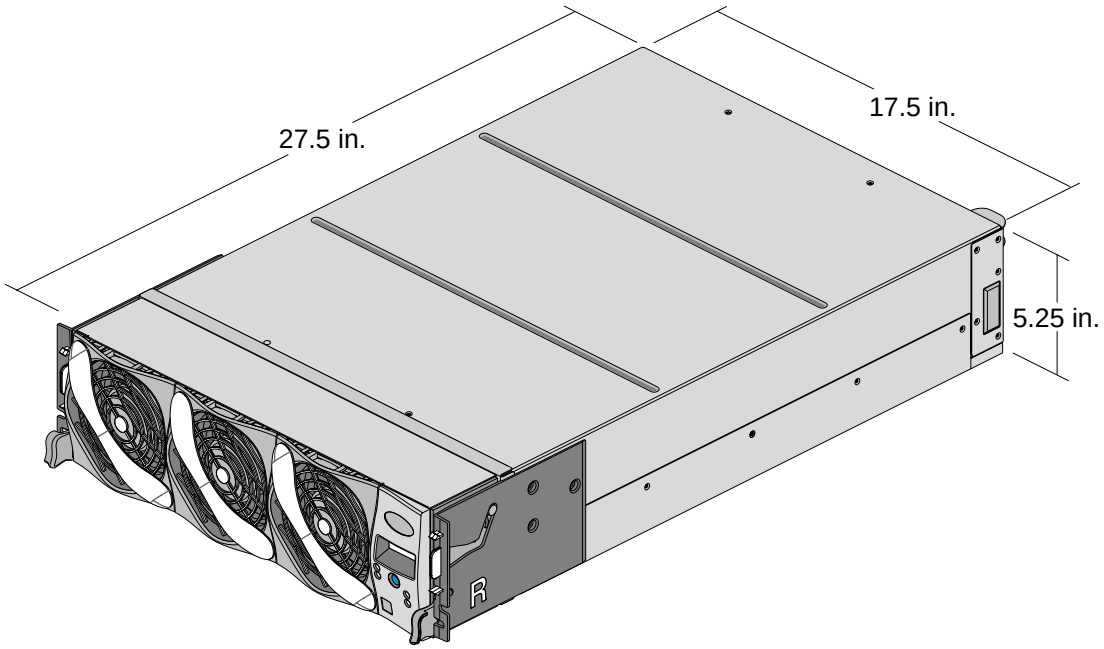



**Figure 2-8** Front View of SNIA 3000 Series C Brick

### 2.2.1 Components

The C brick houses a removable logic carrier that slides in and out of the brick (refer to Figure 2-9). The logic carrier contains the following components:

- IP37 board
- Dual-inline memory modules (DIMMs)
- L1 controller
- Fans

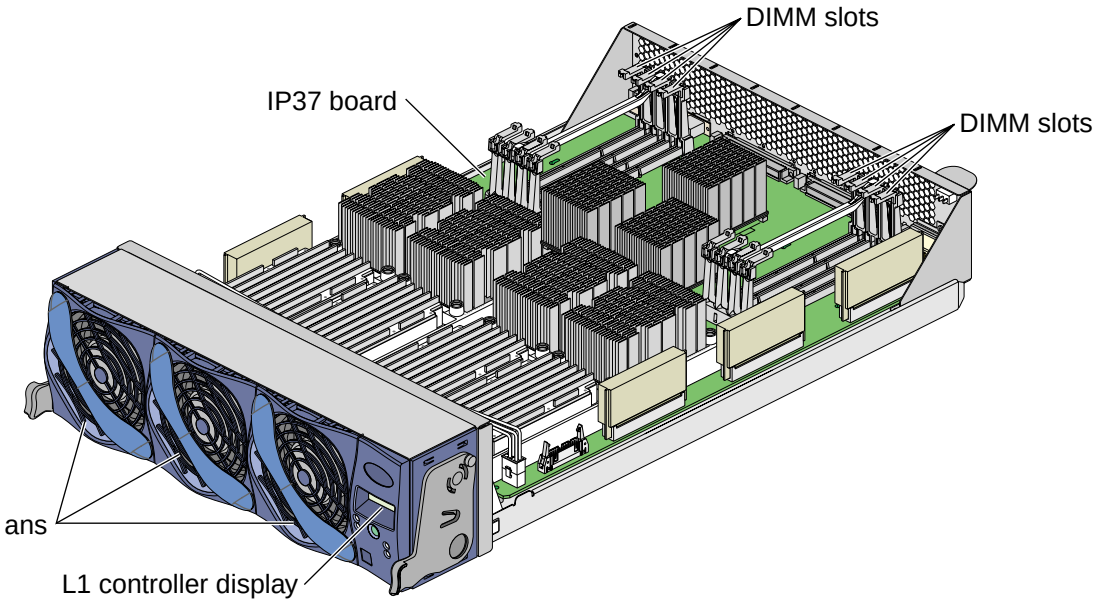



**Figure 2-9** Logic Carrier of SNIA 3000 Series C Brick

#### 2.2.1.1 IP37 Board

An IP37 board contains (refer to Figure 2-10):

- Four Itanium processor sockets; each socket can seat a processor heatsink assembly that contains a cartridge and a heatsink. The cartridge contains one Itanium processor and 2 or 4 Mbytes of L3 cache.
- Four power PODs; each power POD supplies power to one Itanium processor.
- Eight DIMM slots
- A hub (also referred to as Bedrock) application-specific integrated circuit (ASIC) that allows communication between the processors, memory, network routers, and I/O devices.
- Two Synergy ASICs; each Synergy ASIC is the interface between one or two Itanium processors and the hub ASIC.
- Five DC-to-DC converters that convert the incoming 48 Vdc to the voltage levels that the IP37 components require:
  - Three 2.5 Vdc, 30 A
  - One 1.5 Vdc, 30 A
  - One 1.8 Vdc, 30 A

The IP37 board also contains the following components that are not shown in Figure 2-10:

- 128 Mbytes of L4 cache
- Boundary scan logic
- A serial ID EEPROM that contains component information
- Inter-integrated circuit bus ($I^2C$) bus for voltage monitoring and control
- L1 controller logic
- Ten light-emitting diodes
  - Two NUMAlink 3 LEDs that the L1 controller controls
  - Two Crosstown2 LEDs that the L1 controller controls
  - Four heartbeat LEDs that the hub ASIC controls
  - Two power LEDs: one for 12 Vdc and one for 48 Vdc
- Five connectors:
  - One power connector that inputs 48 Vdc from the power bay
  - One NUMAlink 3 connector that connects the C brick to the NUMAlink 3 interconnect (The NUMAlink 3 interconnect can be an R brick or a C brick if the system does not have an R brick.)
  - One Crosstown2 connector that connects the C brick to an I or P brick
  - One console connector that connects the C brick to the console
  - One USB port connector that connects the C-brick L1 controller to the rack controller (also referred to as the Level 2 [L2] controller)

    **Note:** The C brick uses the USB port only when the system does not have an R brick.

You can access the power, NUMAlink 3, Crosstown2, console, and USB port connectors at the rear of the brick (refer to Figure 2-11). On the rear of the C-brick enclosure, the connectors are labeled as follows:

- Power connector - PWR
- NUMAlink 3 connector - LINK (NI)
- Crosstown2 connector - XIO (II)
- Console connector - CONSOLE
- USB port - L1 PORT

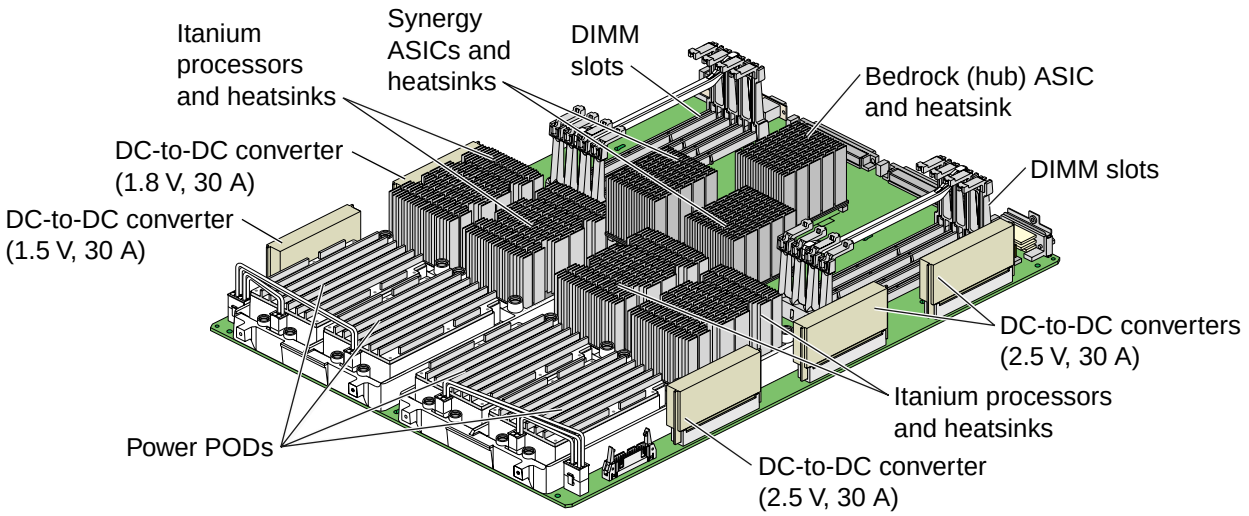



**Figure 2-10** IP37 Board

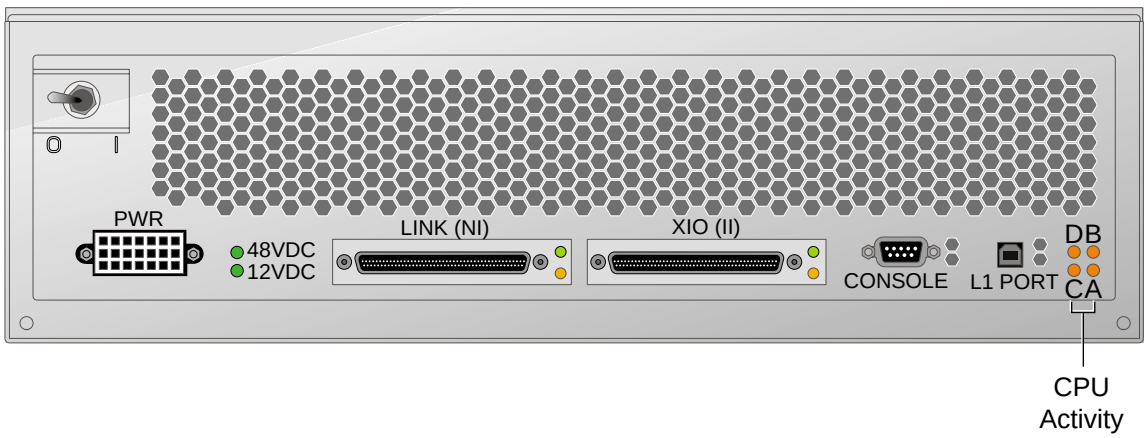



**Figure 2-11** Rear View of SNIA 3000 Series C Brick

#### 2.2.1.2 Dual-inline Memory Modules (DIMMs)

**Note:** The SGI SNIA 3000 series servers use the same DIMMs as the SGI Origin 3000 series servers.

Each SNIA 3000 C brick can contain up to eight DIMMs: two DIMMs per bank pair of memory. For example, Banks 0 and 1 share two DIMMs, Banks 2 and 3 share two DIMMs, Banks 4 and 5 share two DIMMS, and Banks 6 and 7 share two DIMMs. The DIMMs contain double-data-rate synchronous dynamic random-access memory (DDR SDRAM) chips that compose main and directory memory (refer to Figure 2-12).

There are two types of DIMMs: standard and premium. The standard DIMM sizes are 256 Mbytes and 512 Mbytes. The premium DIMMs are also available in 512 Mbytes as well as 1 Gbyte.

**Note:** You can increase or decrease the size of memory by bank pair (two DIMMs). The two DIMMs that compose a bank pair must be the same size; however, the four bank pairs within a C brick can be different memory sizes.

The DIMMs also have a serial ID EEPROM that contains the part number, date code, and memory chip manufacturer.

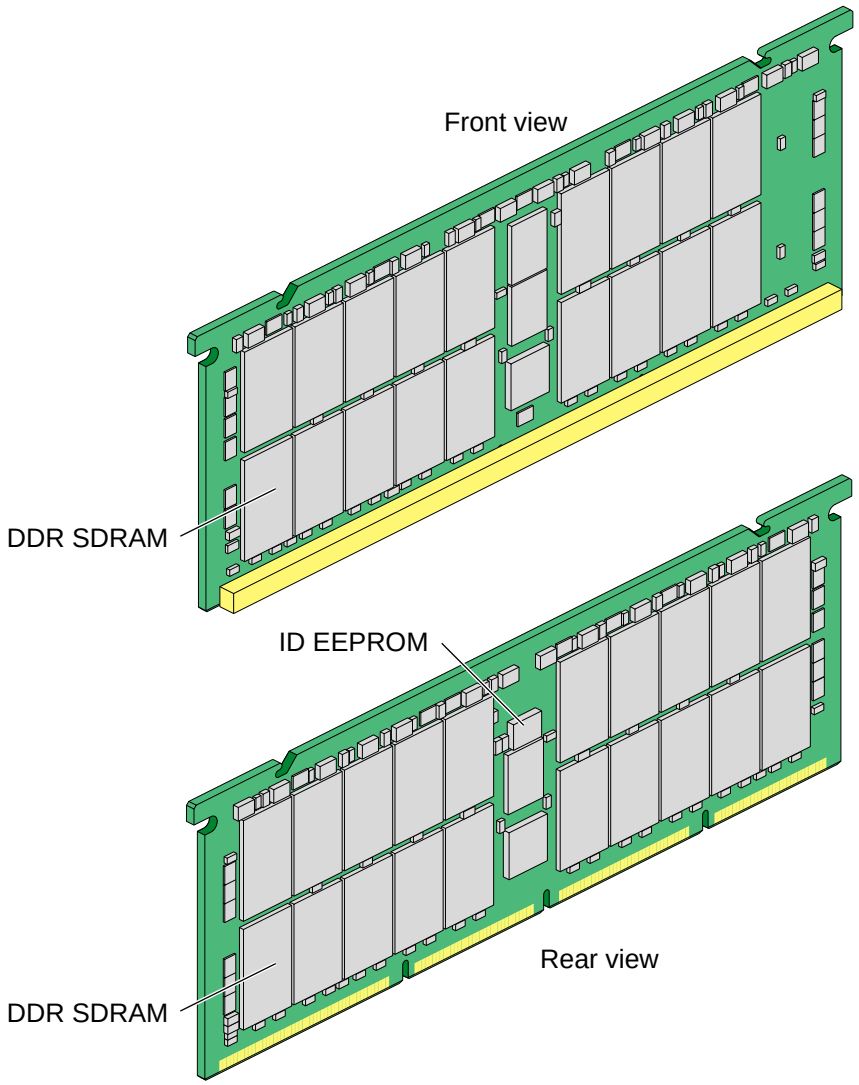



**Figure 2-12** 512-Mbyte DIMM

#### 2.2.1.3 L1 Controller

**Note:** The SGI SNIA 3000 series servers use the same L1 controller as the SGI Origin 3000 series servers.

The L1 controller monitors and controls the environment of the C brick. For example, the L1 controller monitors and controls the following items:

- Fan speed
- Operating temperature
- Voltage margins
- System LEDs

The L1 controller also reads component information from serial ID EEPROMs, provides a console connection, and interfaces with its own 2-line x 12-character liquid crystal display (LCD).

The L1 controller consists of the display, logic components, and a display cable. The display is located at the front of the C brick. The logic components are located on the IP37 board. The cable connects the display to the logic components (refer to Figure 2-13).

For more information about the L1 controller, refer to Chapter 4 of this document or to the *System Controllers* document, publication number 108-0241-001.

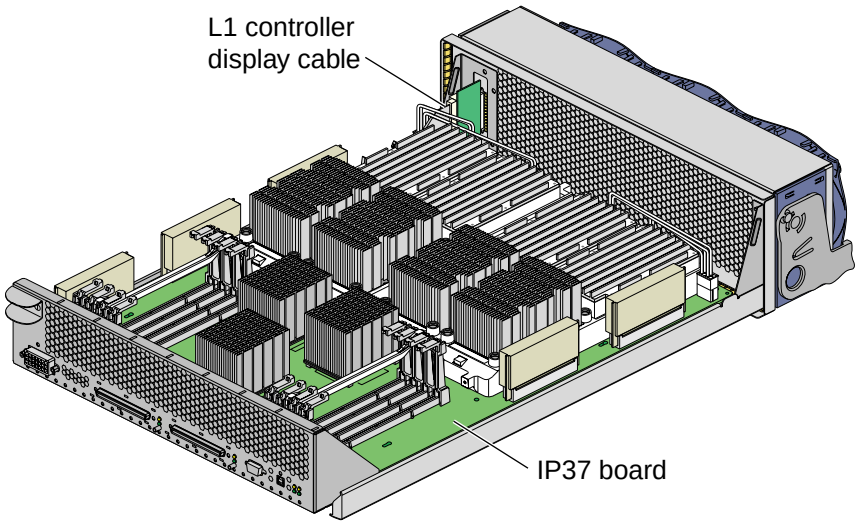



**Figure 2-13** SNIA 3000 Series C-brick L1 Controller Display Cable

#### 2.2.1.4 Fans

**Note:** The SGI SNIA 3000 series servers use the same fans as the SGI Origin 3000 series servers.

The C brick is an air-cooled device; three fans, which are located at the front of the C brick, move air from the front of the rack, through the C brick, to the rear of the rack. These fans are N+1 redundant, can be hot swapped, and run at variable speeds.

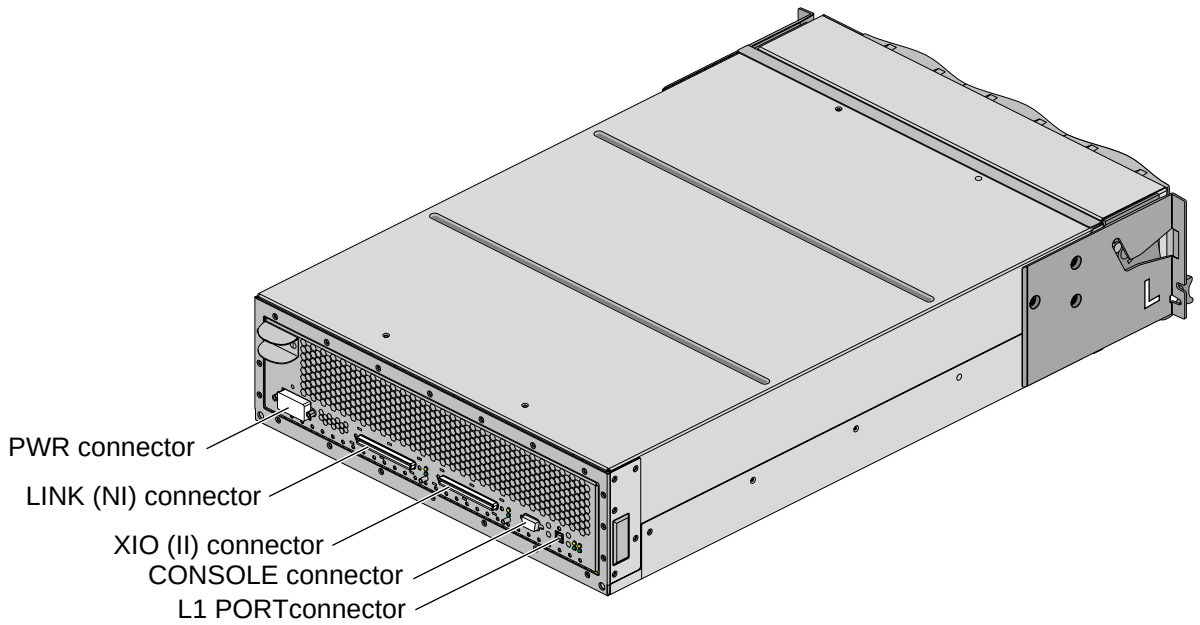
### 2.2.2 Field Replaceable Units (FRUs)

To perform most maintenance activities on the C brick you must power down the C brick; however, the system can remain powered up. The operating system allows you to idle the partition that includes the C brick. Once the partition is idled, you can power down the C brick, perform the maintenance activity, power up the C brick, and reconfigure the partition into the system; all of these activities can occur while the operating system is running in the other partitions.

**Note:** You can replace a fan while the C brick is powered up.

The C-brick FRUs include the following components:

- Logic carrier assembly
- Itanium processor and heatsink
- Power POD
- Memory DIMMs
- Fans
- Fan-box assembly without fans
- L1 controller display printed circuit assembly (PCA)
- Harness assemblies
- DC-to-DC converters (1.5 V - 30 A, 1.8 V - 30 A, 2.5 V - 30 A)
- Cable docks
- Lever service
- Rack ears




**Note:** The rear view of the SNIA 3000 C brick is the same as the rear view of the Orign 3000 C brick.

**Figure 2-14** Rear View of SNIA 3000 Series C Brick

## 2.3 R Brick

The function of the R brick depends on the physical location and cabling of the R brick within the system. The R brick can perform any of the following three functions:

- Router - Routes information between C bricks, either directly or through other R bricks.
- MetaRouter - Routes information between R bricks (for systems that have more than 128 processors).
- Repeat router - Routes information between MetaRouters and routers (for systems that have more than 256 processors) and between MetaRouters (for systems that have more than 384 processors).

**Note:** The routers, MetaRouters, and repeat routers have identical hardware.

The R brick requires 2 U of space within the rack (refer to Figure 2-15). Table 2-4 lists the specifications of the R brick.

**Table 2-4** R-brick Specifications

| Characteristic | Specification |
|---|---|
| Height | 3.3 in. (83.82 mm) |
| Width | 17.38 in. (441.45 mm) |
| Depth | 27.5 in. (609.60 mm) |
| Weight | 20 lb (9 kg) |

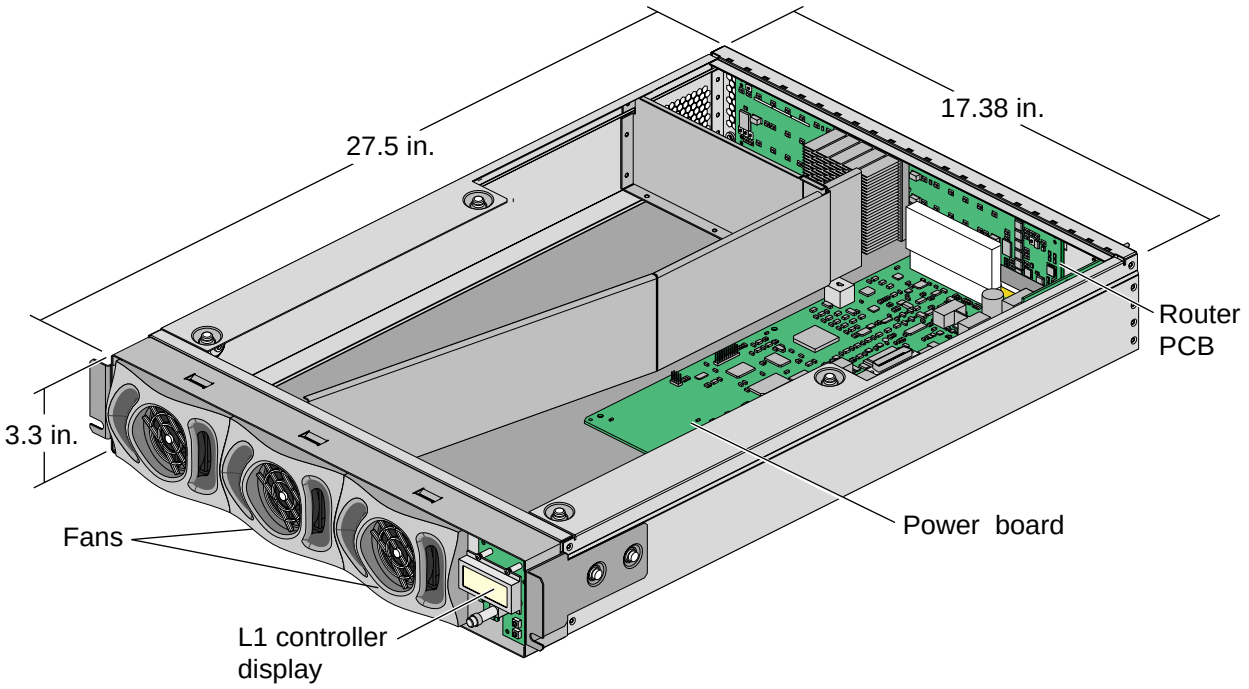



**Figure 2-15** Front View of R Brick

### 2.3.1 Components

The R brick contains the following components:

- Router printed circuit board (PCB)
- Power board
- L1 controller
- Fans

#### 2.3.1.1 Router PCB

A router PCB contains a router ASIC, connectors, LEDs, and a USB hub (refer to Figure 2-16 and Figure 2-17). When the R brick is a router, the router ASIC uses eight NUMAlink 3 ports to transfer packets of information between C bricks and R bricks: four ports connect to C bricks and four ports connect to other R bricks. When the R brick is a MetaRouter or repeat router, the router ASIC can use the eight NUMAlink 3 ports to connect to other R bricks.

**Note:** The SGI 3800 servers require all eight ports of the R brick. The SGI 3400 servers require only six ports; therefore, the R bricks of the SGI 3400 servers have two ports disabled. Disabling two ports prevents illegal system upgrades or mergers that violate Federal and International export laws, invalidate SGI contractual agreements, and / or decrease SGI revenue.

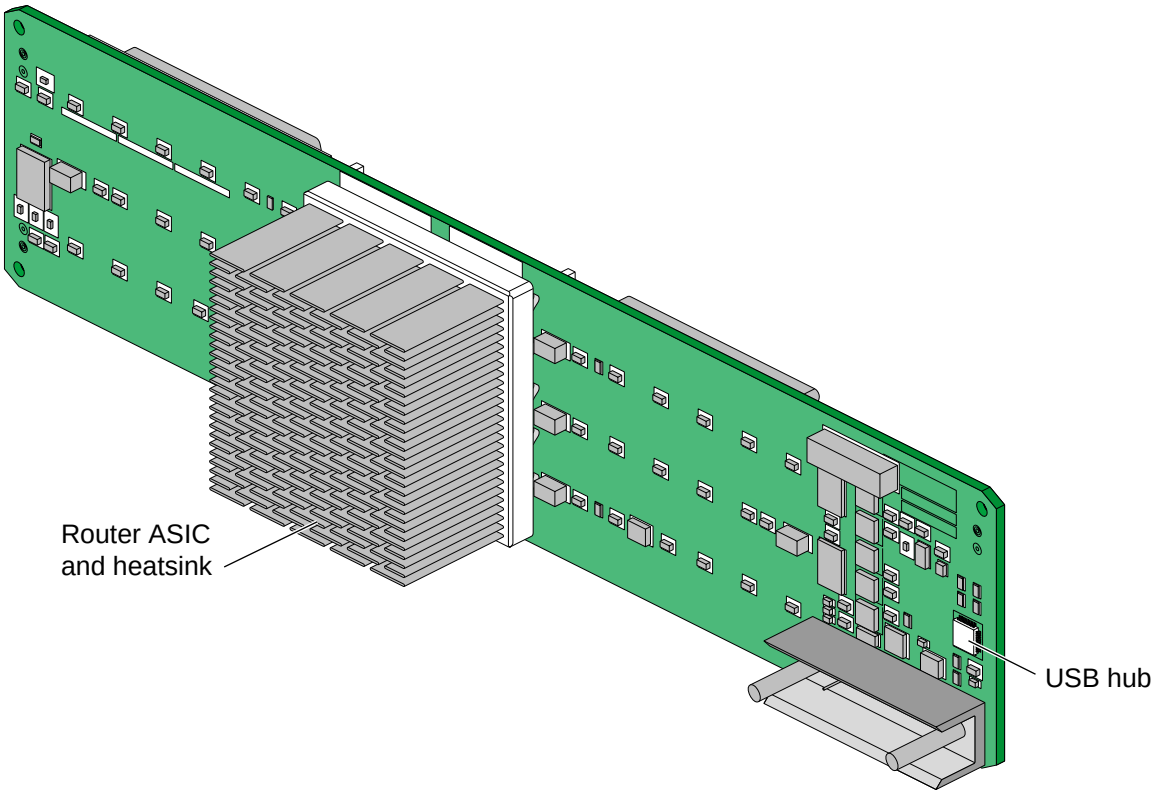



**Figure 2-16** Front View of Router PCB

Each NUMAlink 3 port has a 100-pin network connector that is located on the rear of the router PCB (refer to Figure 2-17). Ports 1, 6, 7, and 8 are for R brick-to-R brick connections only. Ports 2, 3, 4, and 5 can be used for R brick-to-C brick connections or for R brick-to-R brick connections. For example, when an R brick is a MetaRouter or a repeat router, all eight ports can connect to other R bricks.

The R brick uses the NUMAlink 3 cables that connect to ports 2, 3, 4, and 5 to distribute USB signals to the C brick (only ports 2, 3, 4, and 5 carry USB signals). When ports 2, 3, 4, and 5 are used for R brick-to-R brick connections, the R bricks ignore the USB signals.

Each NUMAlink 3 port has two LEDs. The hardware LED, which is green when illuminated, indicates that a cable is connected properly between the R brick and another brick. The software LED, which is yellow when illuminated, indicates that the L1 controller detected the “Remote Power OK” signal from the brick on the other end of the cable. The LEDs are located on the rear of the router PCB (refer again to Figure 2-17).

The USB hub is the interface between the L1 controllers of four C bricks and the L2 controller. It receives the USB signals from the L2 controller via a USB port (refer again to Figure 2-17) and distributes these USB signals to the L1 controllers of the four C bricks. The USB hub is also the interface between the R-brick L1 controller and the L2 controller.

You can access the USB port, the NUMAlink 3 connectors, and the NUMAlink 3 LEDs at the rear of the brick (refer to Figure 2-17, Figure 2-20, and Figure 2-21).

**Note:** The USB port is labeled L1 PORT on the enclosure of the R brick (refer to Figure 2-21).

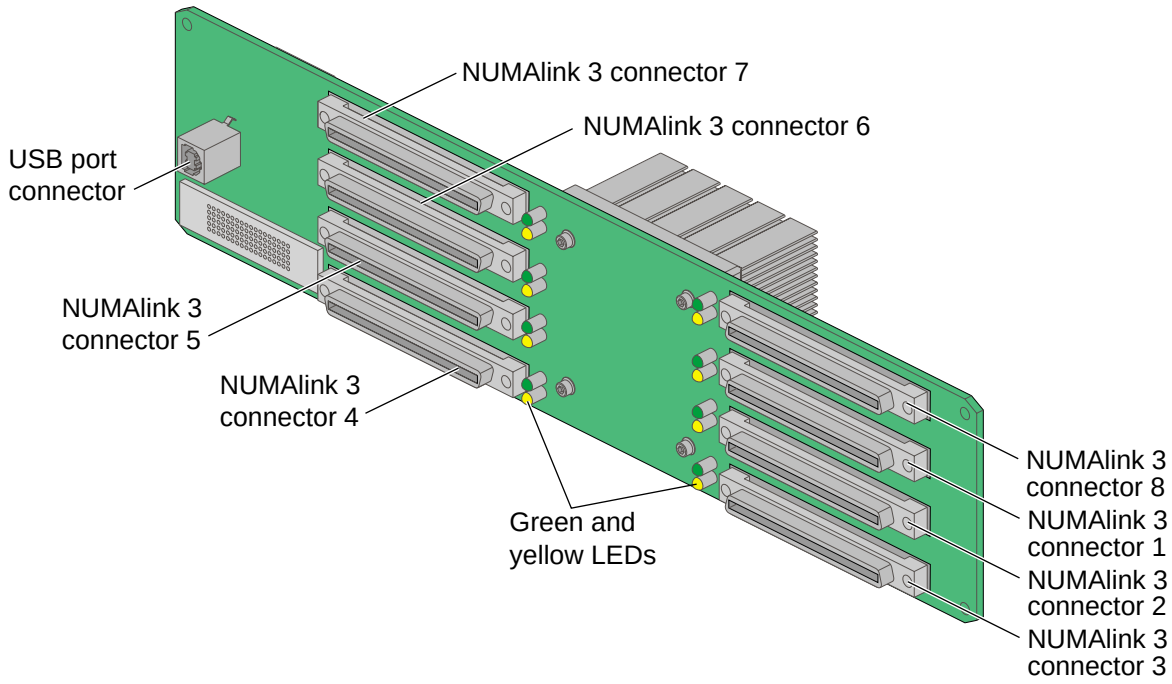



**Figure 2-17** Rear View of Router PCB

#### 2.3.1.2 Power Board

The power board connects to the router PCB via the power connector (refer to Figure 2-18). It contains the following VRM and voltage regulators that convert the incoming 48 Vdc to voltage levels that the components within the brick require:

- 2.5-V, 30-A voltage regulator module (VRM 1)
- 5-V, 3-A voltage regulator
- 3.3-V voltage regulator

The power board also contains a serial ID EEPROM and the L1 controller logic (refer to the orange-colored logic components in Figure 2-18).

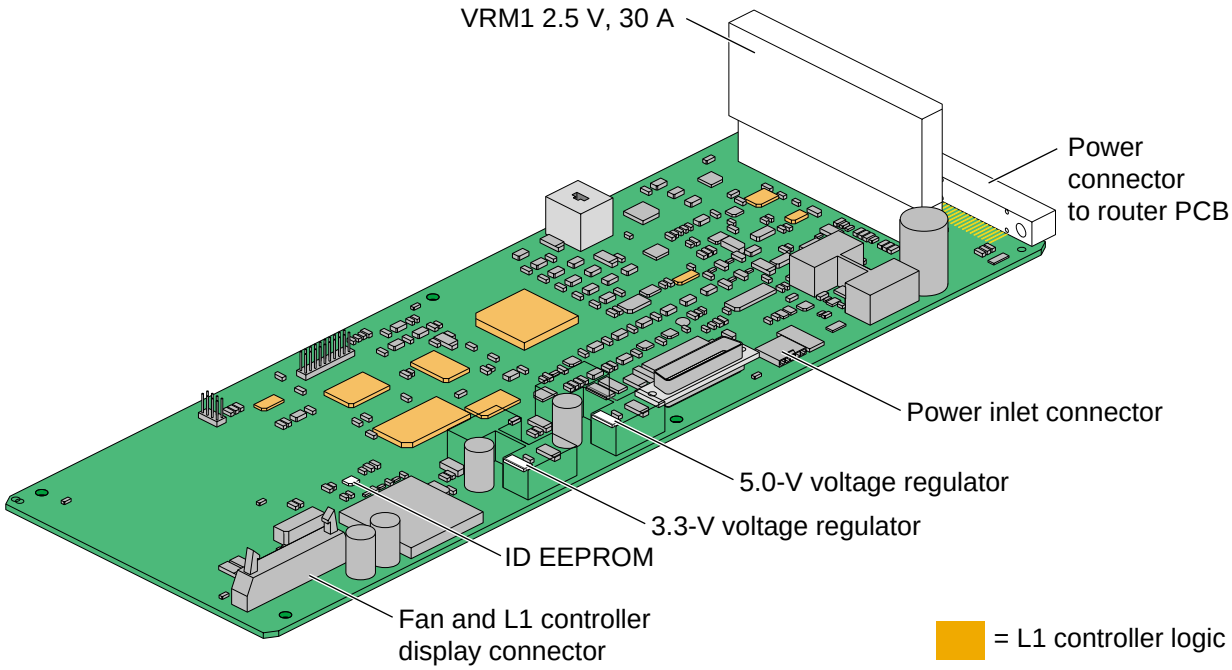



**Figure 2-18** R-brick Power Board

### 2.3.1.3 L1 Controller

The L1 controller monitors and controls the following R-brick environments:

- Operating temperature
- Voltage margins
- System LEDs

The L1 controller also reads component information from serial ID EEPROMs, provides a console connection, and interfaces with its own 2-line x 12-character LCD. The R-brick L1 controller connects to the L2 controller via a USB hub and a 4-pin USB port connector (refer to Figure 2-19).

The L1 controller consists of the display, logic components, and a display cable. The display is located at the front of the R brick. The logic components are located on the power board. The cable connects the display to the logic components (refer to Figure 2-20).

For more information about the L1 controller, refer to Chapter 4 of this document or to the *System Controllers* document, publication number 108-0241-001.

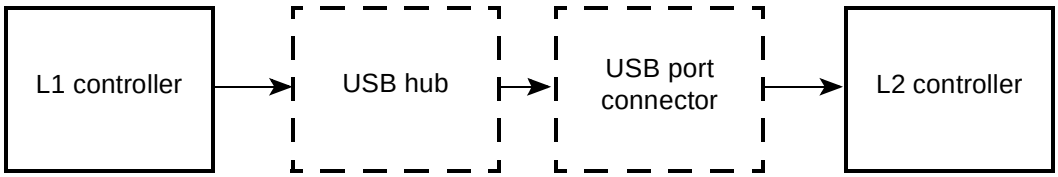



**Figure 2-19** R-brick Connection to the L2 Controller

#### 2.3.1.4 Fans

The front of the R brick contains two cooling fans. These fans are different from the other brick fans; they are smaller and run at a single speed. The R brick fans are N+1 redundant and can be hot swapped.

**Note:** Because all of the other bricks have three fans, the fan molding of the R brick is designed so that the R brick looks like it has three fans. The middle and right fans are functional. The left fan is not functional.

### 2.3.2 FRUs

The system must be powered down during all maintenance activities of the R brick except fan and cable-dock replacement.

The R-brick FRUs include the following components:

- R-brick enclosure assembly
- Power board
- Power input PCA
- Fans
- Fan box assembly without fans
- VRM (2.5 V - 30 A)
- L1 controller display PCA
- Harness assemblies
- Cable docks
- Rack ears

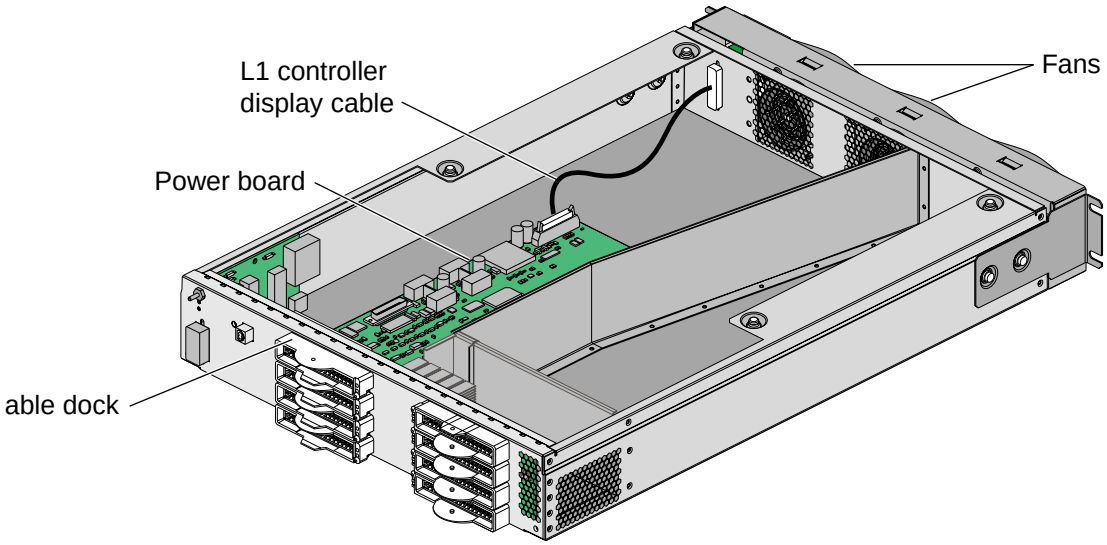



**Figure 2-20** Rear View of R Brick

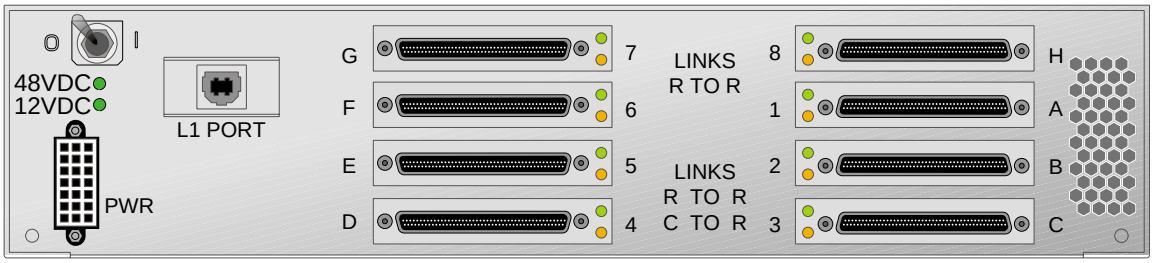



**Figure 2-21** R-brick Labeling (Rear)

## 2.4 I Brick

The I brick provides all of the boot I/O functions for a system, houses PCI cards, and has two Crosstown2 ports that connect the I brick to a C brick.

**Note:** For SGI Origin 3000 series servers, a Crosstown2 port can also connect to a G brick.

The L1 controller selects one of two speeds for the Crosstown2 ports: 800 Mbyte/s or 1200 Mbyte/s.

The I brick requires 4 U of space within the rack (refer to Figure 2-22). Table 2-5 lists the specifications of the I brick.

**Table 2-5** I-brick Specifications

| Characteristic | Specification |
|---|---|
| Height | 7.0 in. (177.80 mm) |
| Width | 17.5 in. (444.50 mm) |
| Depth | 27.5 in. (698.50 mm) |
| Weight | 70 lb (31.50 kg) |

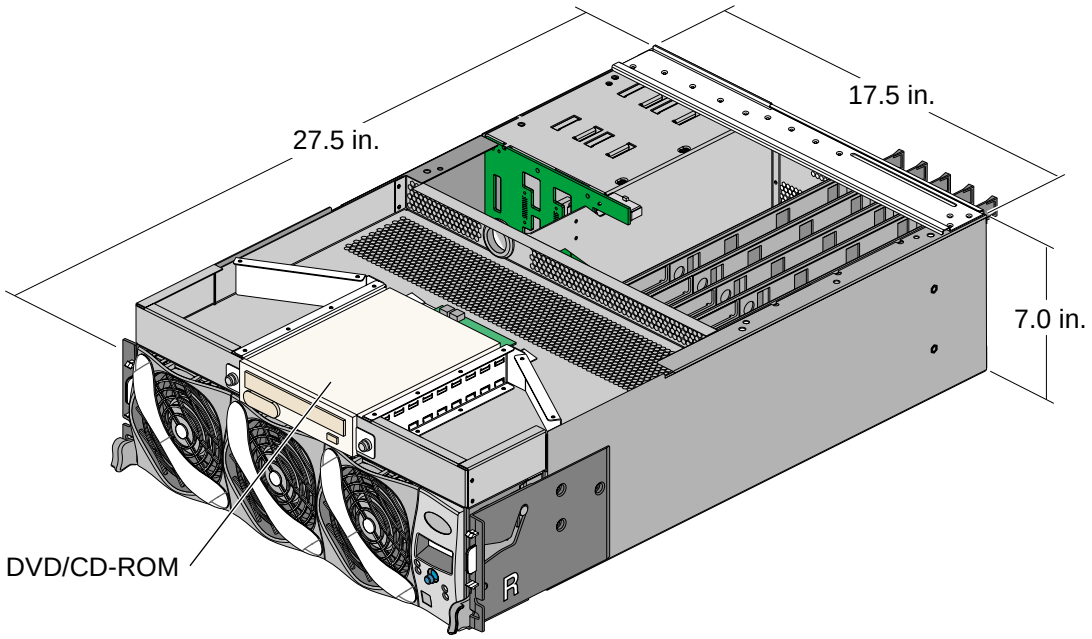



**Figure 2-22** Front View of I Brick

### 2.4.1 Components

The I brick contains the following components:

- PCI motherboard
- PCI cards and carriers
- Power board
- Fibre Channel disk drives
- DVD / CD-ROM
- L1 controller
- Fans

#### 2.4.1.1 PCI Motherboard

The PCI motherboard contains (refer to Figure 2-23):

- An Xbridge ASIC that is the interface between the two Crosstown2 ports and the PCI cards
- Five PCI card slots
- A connector that connects the PCI motherboard to the power board
- A serial ID EEPROM that contains component information (not shown in Figure 2-23)
- IO7 connectors
- Two Crosstown2 connectors that are labeled XIO 10 and XIO 11 on the rear of the I brick (refer to Figure 2-24)

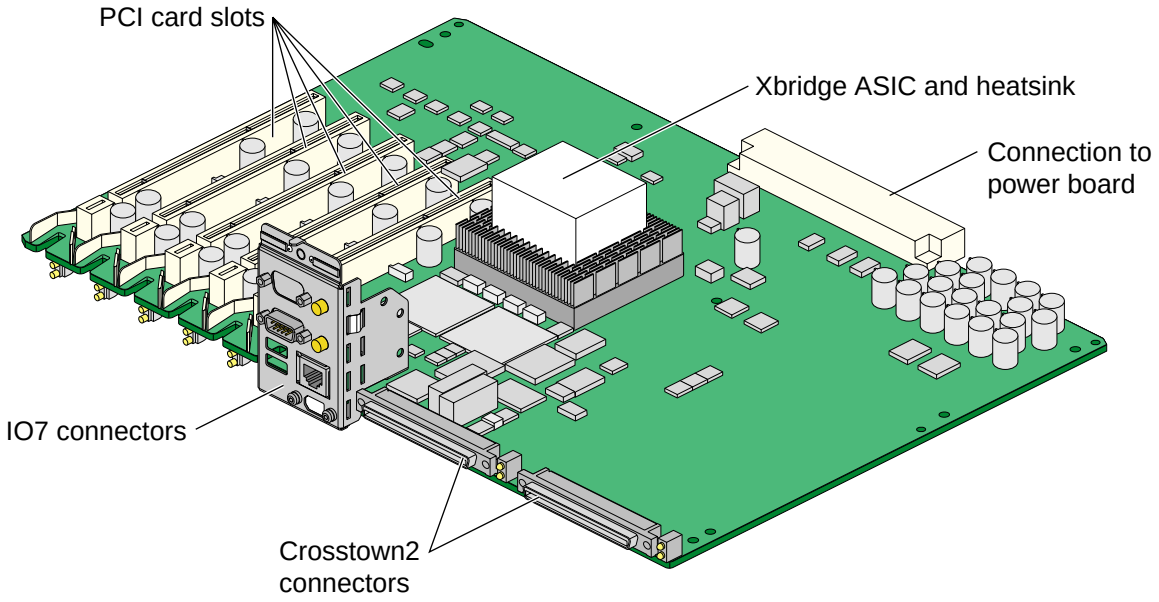



**Figure 2-23** PCI Motherboard

The PCI motherboard can seat up to five 3.3-V or universal PCI cards that are mounted on PCI carriers. The PCI card slots, which are located at the rear of the I brick, are numbered Bus 1 - Slots 1, 2, and 3 and Bus 2 - Slots 1 and 2 (refer to Figure 2-24).

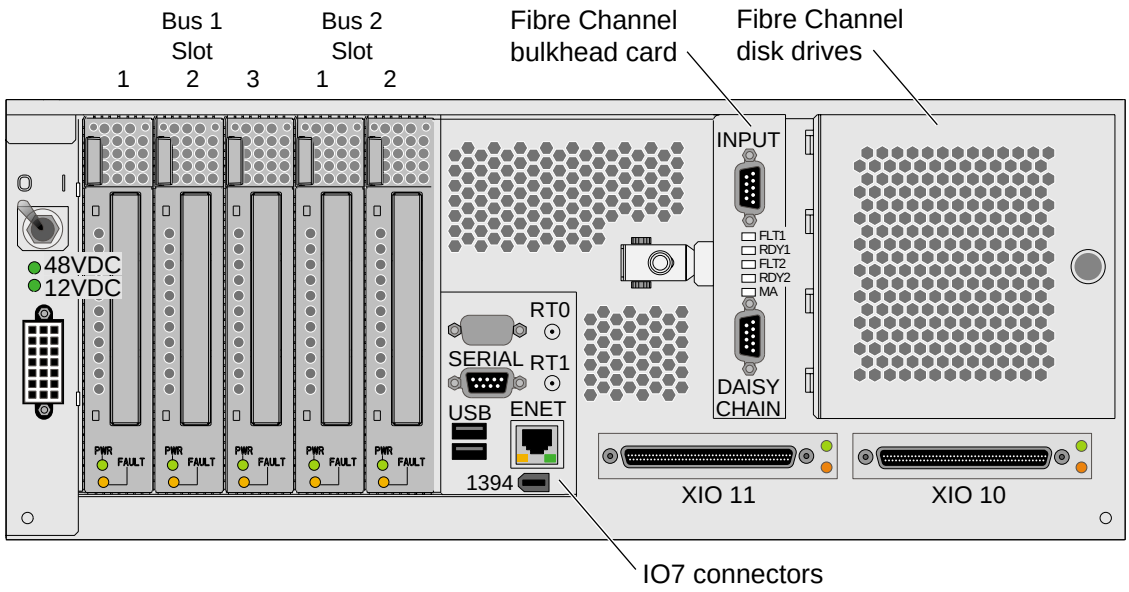



**Figure 2-24** I-brick PCI Card Slot Numbering

### 2.4.1.2 PCI Cards and Carriers

The 3000 series servers support various PCI cards that are purchased from manufacturers who specialize in peripheral devices. Each PCI card is mounted to a carrier so that you can slide the PCI cards into and out of the brick. The PCI cards connect to the motherboard when the PCI carrier is fully inserted into the brick.

The PCI carrier has a fixed size; however, it contains an assembly that adjusts to fit the varying sizes of the PCI cards (refer to Figure 2-25). Each PCI carrier holds one PCI card. To accommodate dual PCI cards, two PCI carriers are joined.

Empty PCI carriers reside in nonpopulated PCI slots to create an even airflow through the PCI slots and to protect against EMI (electromagnetic interference).

**Note:** When you need to add a PCI card to the system, you can remove an empty PCI carrier from the system, mount the PCI card onto the empty PCI carrier, and insert the PCI card and carrier into the vacant slot. For information about PCI card insertion and removal, refer to the *Hardware Replacement Procedures* document, publication number 108-0249-001.

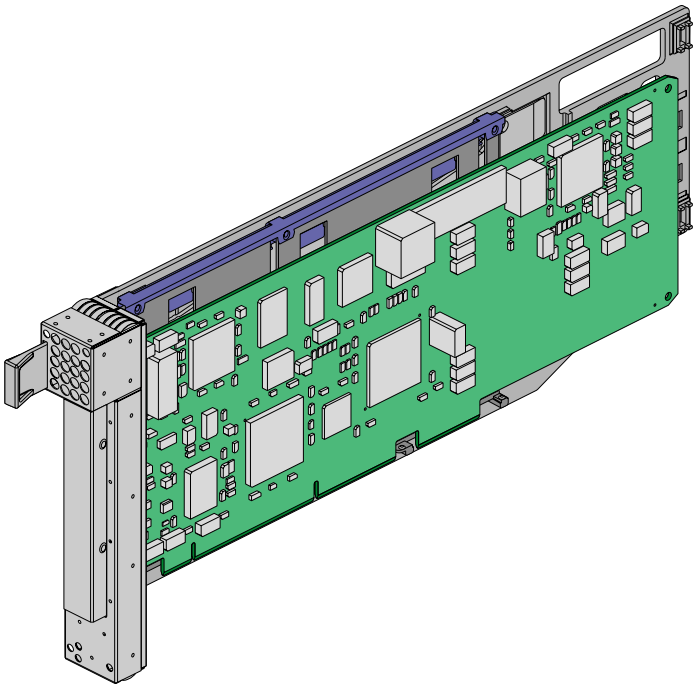


**Figure 2-25** PCI Carrier with PCI Card Installed

#### 2.4.1.3 Power Board

The power board contains the logic components of the L1 controller (refer to the orange-colored components in Figure 2-26), five VRMs, one DC-to-DC converter, and three voltage regulators. The VRMs, DC-to-DC converter, and voltage regulators convert the incoming 48 Vdc to voltage levels that the components within the brick require.

- One 12-Vdc, 10-A voltage regulator module (VRM 1)
- One 5-Vdc, 25-A voltage regulator module (VRM 2)
- Two 3.3-Vdc, 30-A voltage regulator modules (VRM 3 and VRM 4)
- One 2.5-Vdc, 30-A voltage regulator module (VRM 7)
- One 12-Vdc, 4.17-A DC-to-DC converter
- One 3.3-Vdc voltage regulator
- Two 5-Vdc voltage regulators

The power board supplies an average of 17.5 W (5.3 A, 3.3 V) of power to each PCI slot; however, a PCI card may consume up to 25 W of power. The L1 controller controls how the power board applies power to the PCI cards. The power board applies power to the PCI cards starting with the lowest numbered slot. It continues to apply power to the PCI slots until all of the power has been consumed. The L1 controller uses two pins in each PCI slot to calculate the power consumption of the PCI cards. The L1 controller prints a message to the console if the power board cannot supply power to all of the PCI cards.

The power board installs horizontally in the front of the brick (refer to Figure 2-28) and plugs into the PCI motherboard.

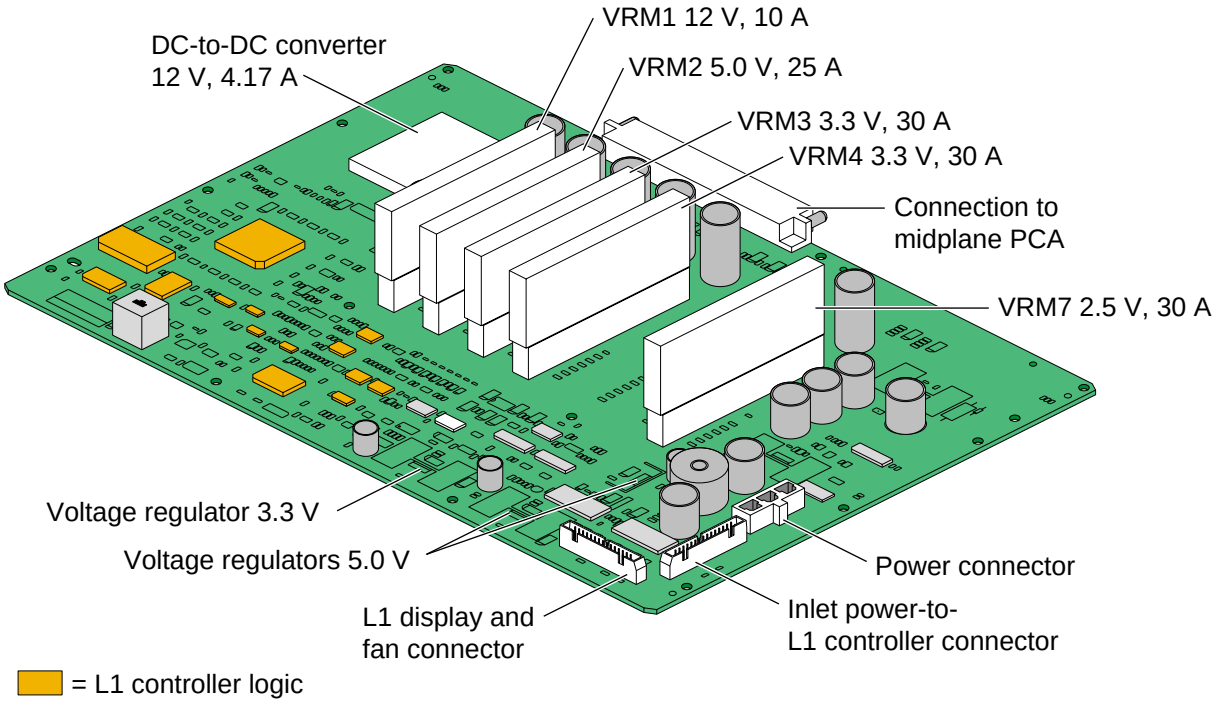



**Figure 2-26** I-brick Power Board

#### 2.4.1.4 Fibre Channel Disk Drives

The I brick contains one or two 3.5-in. Fibre Channel disk drives that are mounted on disk carriers (refer again to Figure 2-24). These disks require connection to a Fibre Channel disk controller, which can be installed in any PCI slot of the I brick. The disks connect to the Fibre Channel controller via a Fibre Channel bulkhead card (refer again to Figure 2-24).

The Fibre Channel disk drives are boot drives and can be configured as separate drives or as mirrored images. The drives are 18-Gbyte disks.

#### 2.4.1.5 DVD/CD-ROM

The DVD / CD-ROM is a single removable media drive that is located in the front of the brick (refer again to Figure 2-22). It connects to the 1394 connector of the PCI motherboard via a goldengate card (refer to Figure 2-27).

The goldengate card converts the IDE (integrated drive electronics) protocol of the DVD / CD-ROM to the IEEE 1394 protocol that the motherboard supports. IEEE 1394 is a high-performance serial bus protocol that provides a low-cost, high-bandwidth universal interconnect technology for digital media, storage, networking, and other applications.

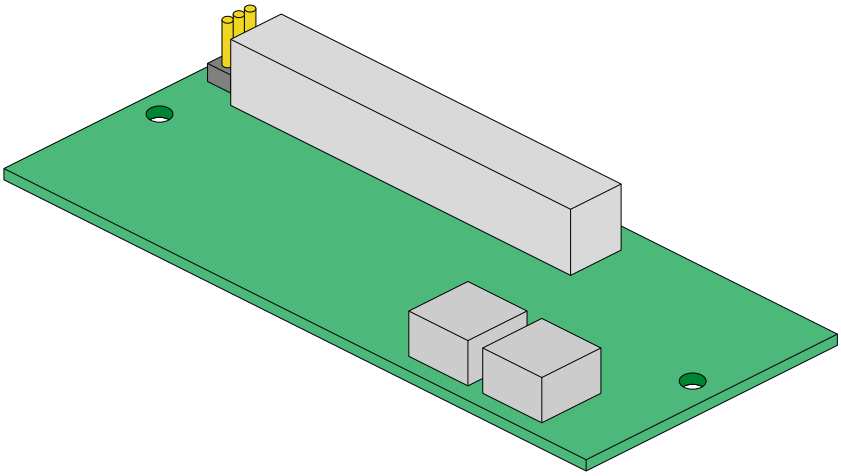


**Figure 2-27** Goldengate Card

### 2.4.1.6 L1 Controller

The L1 controller monitors and controls the environment of the I brick. It consists of a display, logic components, and a cable. The display is located on the front of the I brick. The logic components are located on the power board. The cable connects the display to the logic components (refer to Figure 2-28).

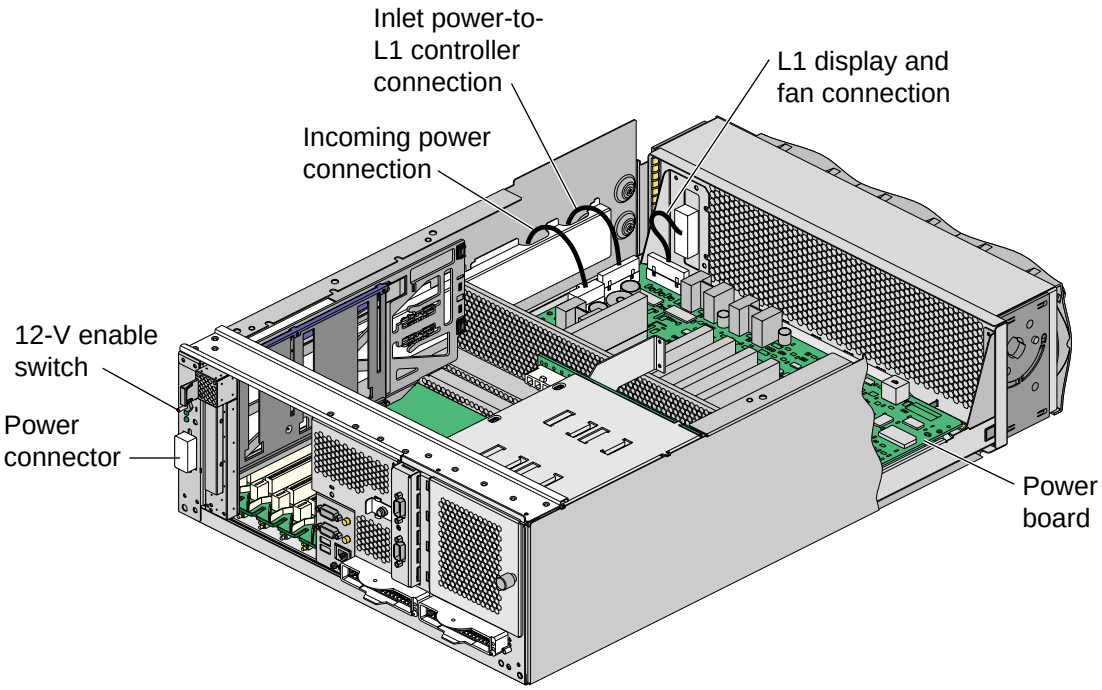



**Figure 2-28** I-brick L1 Controller Display Cable

### 2.4.1.7 Fans

Three fans cool the I brick. The fans, which are located at the front of the I brick, move air from the front of the rack, through the I brick, to the rear of the rack. These fans are N+1 redundant, can be hot swapped, and run at variable speeds.

**Note:** The L1 controller controls the fan speed.

### 2.4.2 FRUs

To perform most maintenance activities on the I brick, the I brick must be powered down; however, the system can remain powered up. The maintenance activities that you can perform with the I brick powered up are the replacement of:

- Fans
- CD-ROM / DVD
- Goldengate card
- Fibre Channel disk drives
- PCI carrier and cards

The I-brick FRUs include the following components:

- Fans
- PCI motherboard
- Power board
- CD-ROM / DVD
- Goldengate card
- Fibre Channel disk drives
- Fibre Channel backplane PCA
- Fibre Channel bulkhead PCA
- Fibre Channel cable (copper)
- PCI carriers
- L1 controller display PCA
- Power inlet PCA
- VRMs (12 V - 10 A, 5 V - 25 A, 3.3 V - 30 A, 2.5 V - 30 A)
- Harness assemblies
- Cable assemblies
- Cable docks

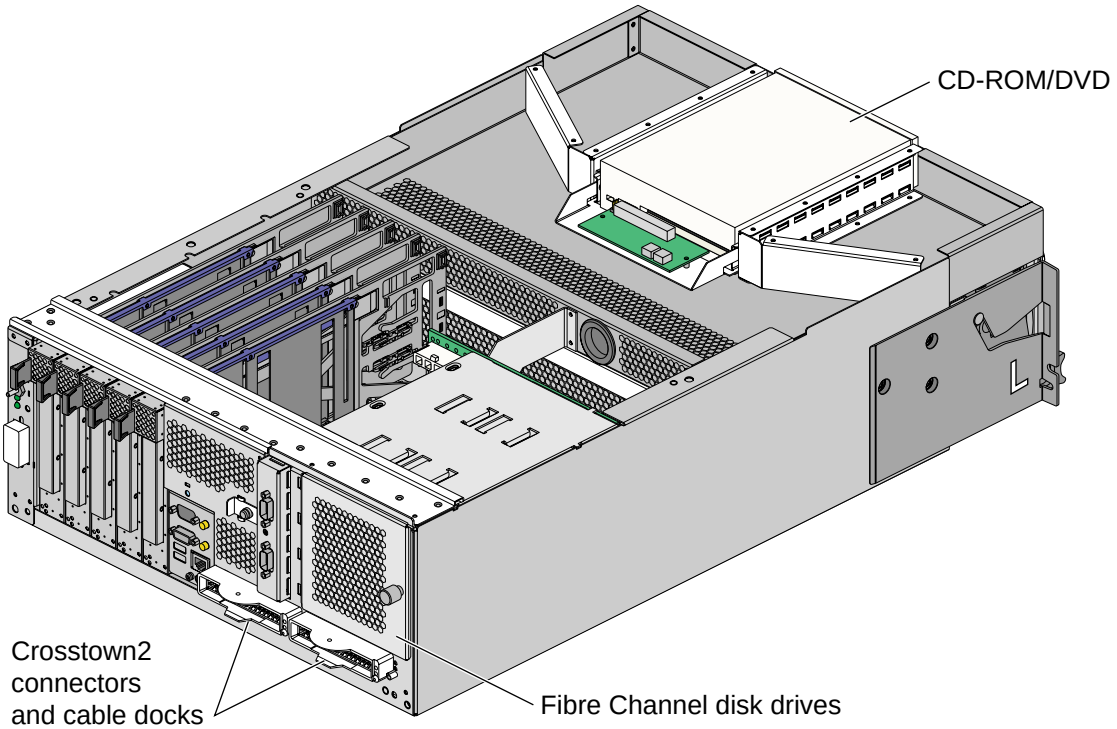



**Figure 2-29** Rear View of I Brick

## 2.5 P Brick

The P brick seats the PCI cards of peripheral devices. It has two Crosstown2 ports that connect the P brick to a C brick. The L1 controller selects one of two speeds for the Crosstown2 ports: 800 Mbyte/s or 1200 Mbyte/s.

The P brick requires 4 U of space within the rack (refer to Figure 2-30) and has the specifications that are listed in Table 2-6.

**Table 2-6** P-brick Specifications

| Characteristic | Specification |
|---|---|
| Height | 7.0 in. (177.80 mm) |
| Width | 17.5 in. (444.50 mm) |
| Depth | 27.5 in. (698.50 mm) |
| Weight | 70 lb (31.50 kg) |

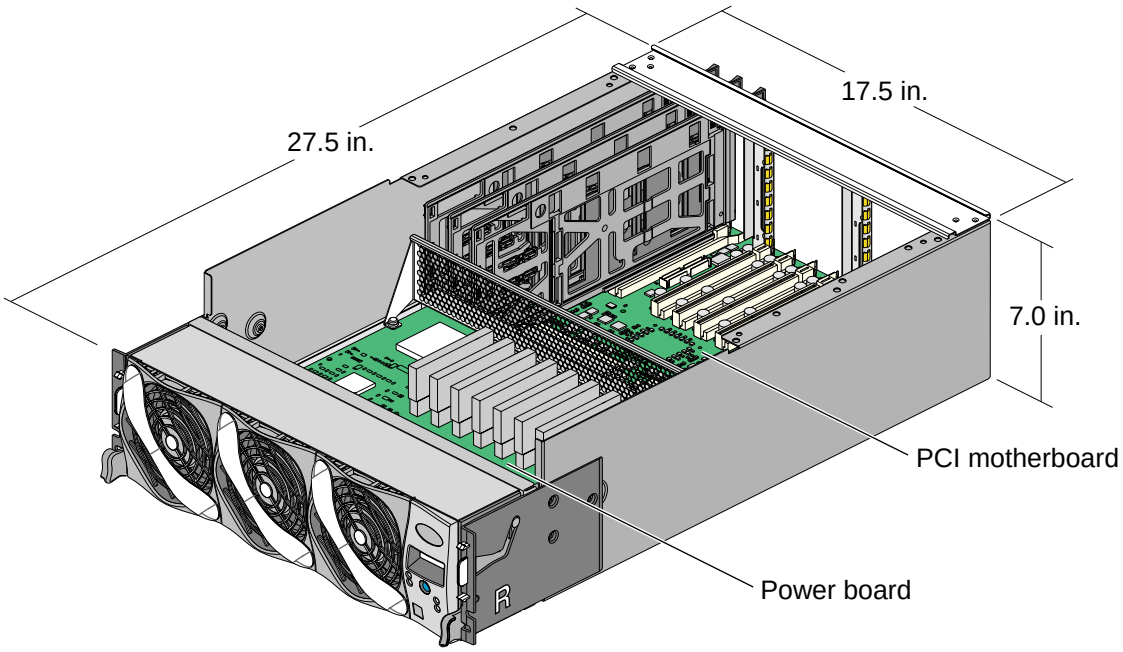



**Figure 2-30** Front View of P Brick

### 2.5.1 Components

The P brick contains the following components:

- PCI motherboard
- PCI cards and carriers
- Power board
- Host interface cards (HICs)
- L1 controller
- Fans

#### 2.5.1.1 PCI Motherboard

The PCI motherboard contains three Xbridge ASICs that are the interface between two Crosstown2 ports and the PCI cards (refer to Figure 2-31). The PCI motherboard also contains twelve PCI slots and a serial ID EEPROM that contains component information (not shown in Figure 2-31).

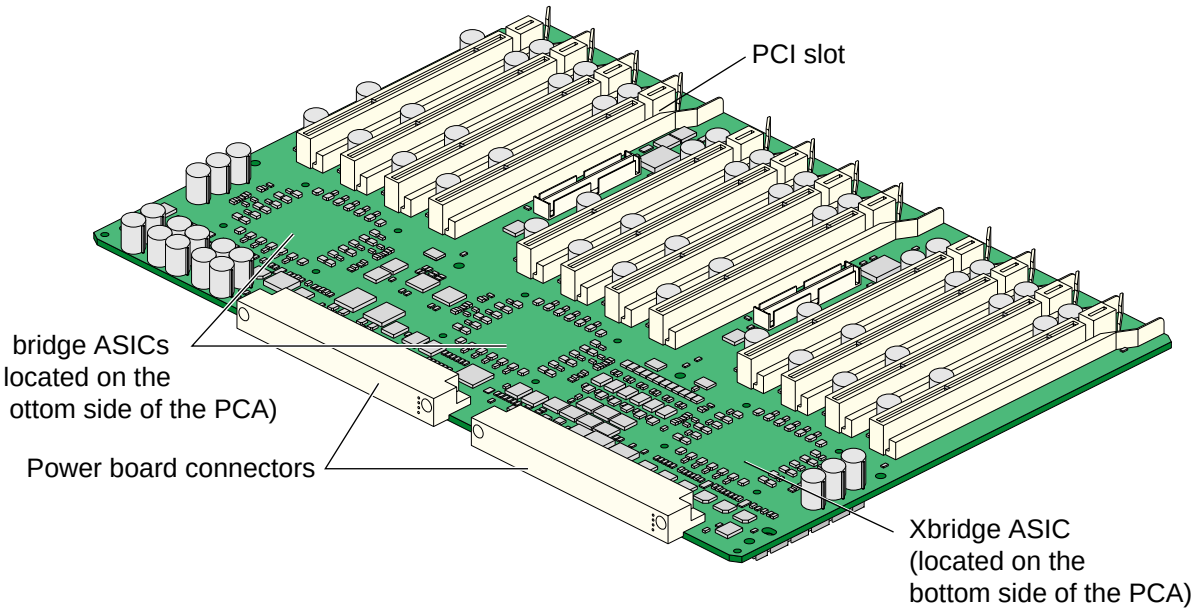



**Figure 2-31** PCI Motherboard

Via the PCI slots, the PCI motherboard can seat up to twelve 3.3-V or universal PCI cards that mount on PCI carriers. The PCI card slots are numbered Bus 1 through Bus 6 (refer to Figure 2-32); each bus has two slots that are labeled 1 and 2.

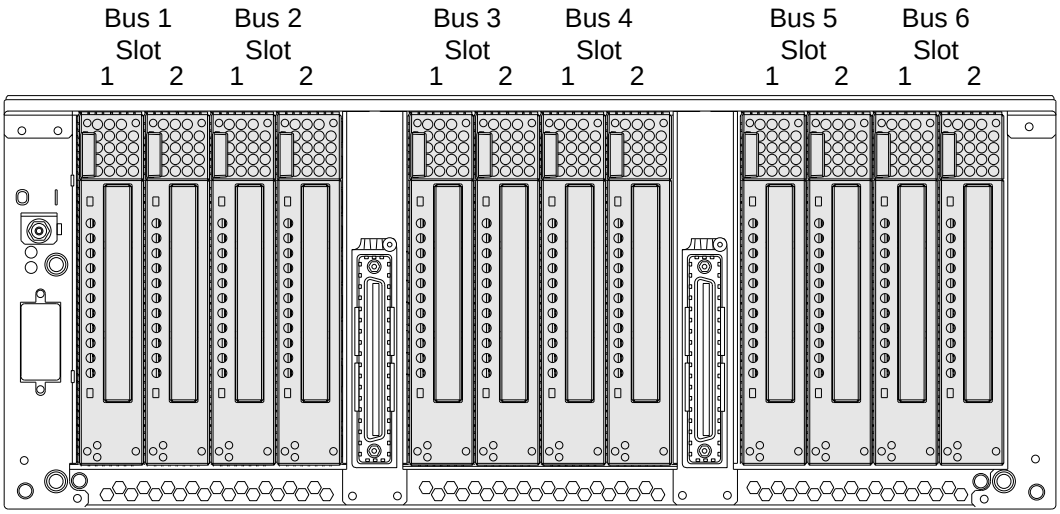



**Figure 2-32** P-brick PCI Card Slot Numbering

#### 2.5.1.2 PCI Cards and Carriers

The 3000 series servers support various PCI cards that are purchased from manufacturers who specialize in peripheral devices. Each PCI card is mounted to a carrier so that you can slide the PCI cards into and out of the brick. The PCI cards connect to the PCI motherboard when the PCI carrier is fully inserted into the brick.

The PCI carrier has a fixed size; however, it contains an assembly that adjusts to fit the varying sizes of the PCI cards (refer to Figure 2-33). Each PCI carrier holds one PCI card. To accommodate dual PCI cards, two PCI carriers are joined.

Empty PCI carriers reside in nonpopulated PCI slots to create an even airflow through the PCI slots and to protect against EMI (electromagnetic interference).

**Note:** When you need to add a PCI card to the system, you can remove an empty PCI carrier from the system, mount the PCI card onto the empty PCI carrier, and insert the PCI card and carrier into the vacant slot. For information about PCI card insertion and removal, refer to the *Hardware Replacement Procedures* document, publication number 108-0249-001.

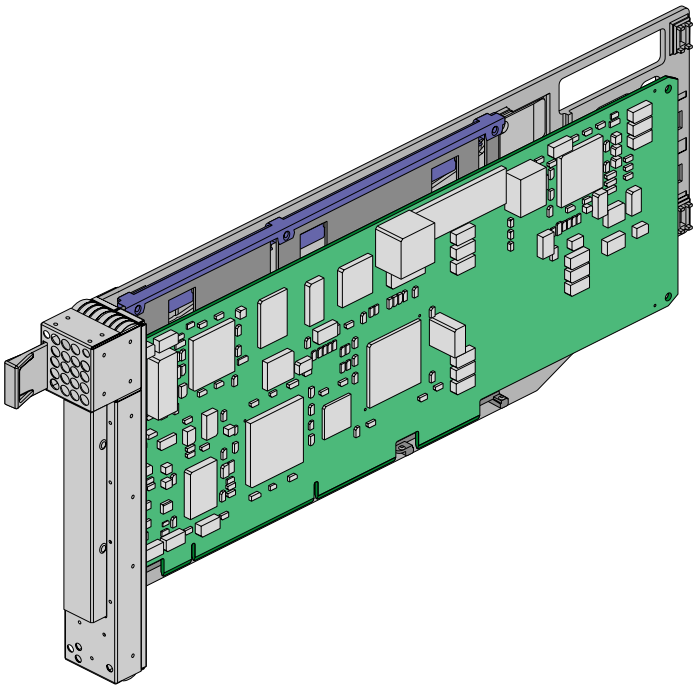


**Figure 2-33** PCI Carrier with PCI Card Installed

#### 2.5.1.3 Power Board

The power board contains the logic components of the L1 controller (refer to the orange-colored components in Figure 2-34), seven VRMs, one DC-to-DC converter, and three voltage regulators. The VRMs, DC-to-DC converter, and voltage regulators convert the incoming 48 Vdc to voltage levels that the components within the brick require.

- One 12-Vdc, 10-A voltage regulator module (VRM 1)
- One 5-Vdc, 25-A voltage regulator module (VRM 2)
- Four 3.3-Vdc, 30-A voltage regulator modules (VRM 3 through VRM 6)
- One 2.5-Vdc, 30-A voltage regulator module (VRM 7)
- One 12-Vdc, 4.17-A DC-to-DC converter
- One 3.3-Vdc voltage regulator
- Two 5-Vdc voltage regulators

The power board supplies an average of 17.5 W (5.3 A, 3.3 V) of power to each PCI slot; however, a PCI card may consume up to 25 W of power. The L1 controller controls how the power board applies power to the PCI cards. The power board applies power to the PCI cards starting with the lowest numbered slot. It continues to apply power to the PCI slots until all of the power has been consumed. The L1 controller uses two pins in each PCI slot to total the power consumption of the PCI cards. The L1 controller prints a message to the console if the power board cannot supply power to all of the PCI cards.

The power board installs horizontally in the front of the brick and plugs into the PCI motherboard (refer again to Figure 2-30).

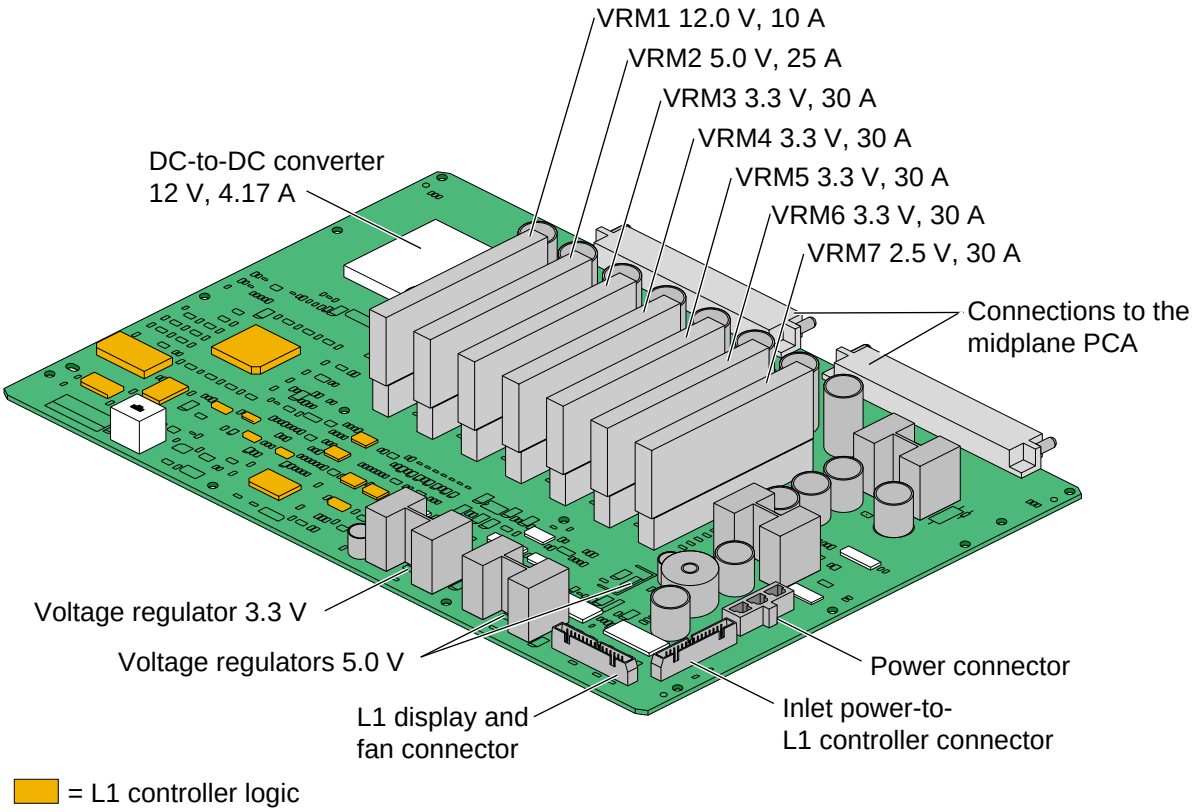



**Figure 2-34** P-brick Power Board

#### 2.5.1.4 Host Interface Cards (HICs)

The P brick uses two HICs. Each HIC contains a Crosstown2 connector and a connector that connects to the PCI motherboard (refer to Figure 2-35). These cards transfer signals between the Crosstown2 cable and the Xbridge ASIC that is located on the PCI motherboard.

The Crosstown2 connectors of the HICs are labeled XIO 10 and XIO 11 on the rear of the P brick (refer to Figure 2-36).

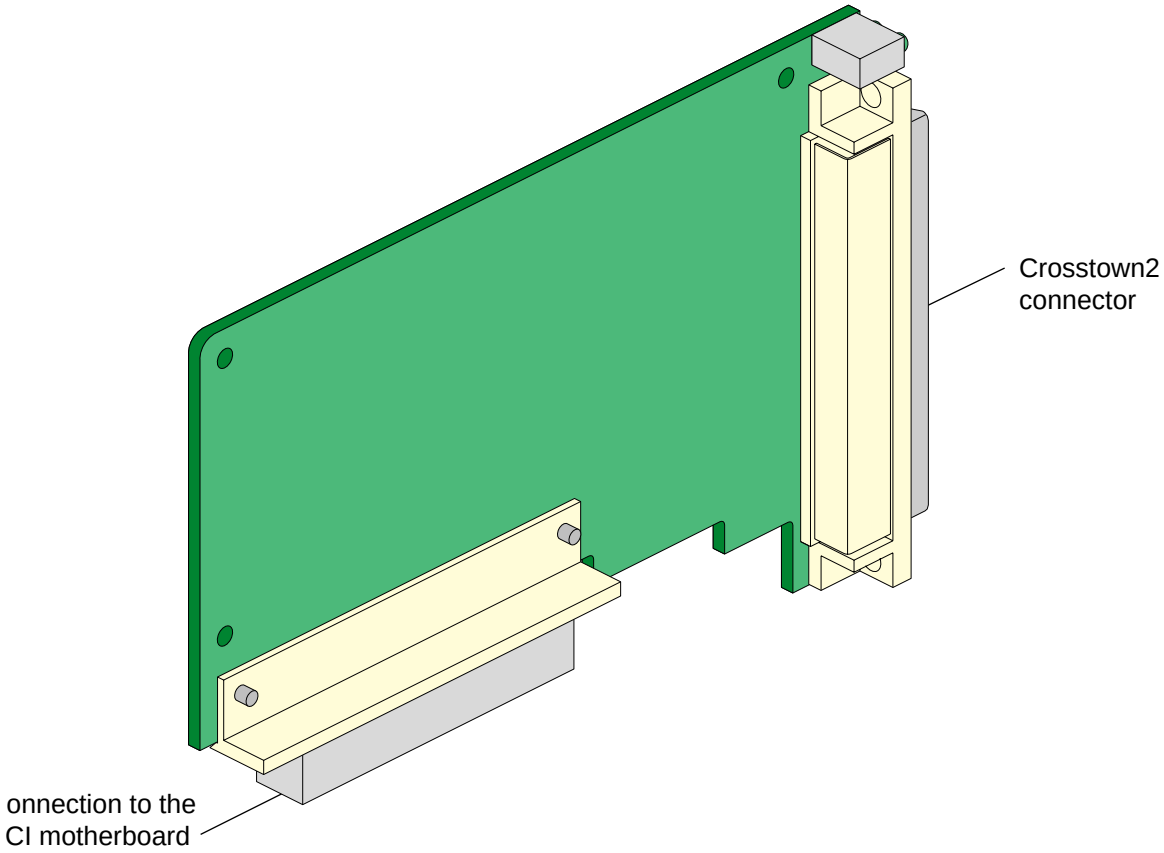



**Figure 2-35** P-brick HICs

### 2.5.1.5 L1 Controller

The L1 controller monitors and controls the environment of the P brick. It consists of a display, logic components, and a cable. The display is located on the front of the P brick. The logic components are located on the power board. The cable connects the display to the logic components (refer to Figure 2-36).

### 2.5.1.6 Fans

The P brick is an air-cooled device; three fans, which are located at the front of the P brick, move air from the front of the rack, through the P brick, to the rear of the rack. These fans are N+1 redundant, can be hot swapped, and run at variable speeds.

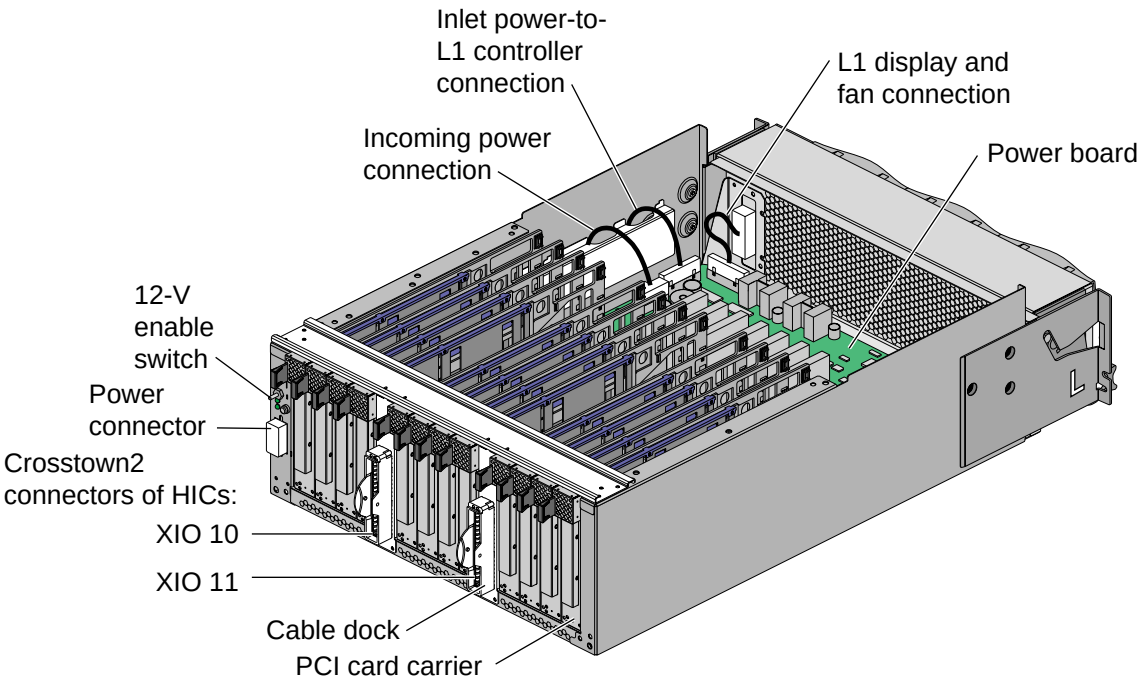



**Figure 2-36** Rear View of P Brick

### 2.5.2 FRUs

To perform most maintenance activities on the P brick, the P brick must be powered down; however, the system can remain powered up. The maintenance activities that you can perform with the P brick powered up are the replacement of:

- Fans
- PCI carrier and cards

The P-brick FRUs include the following components:

- PCI motherboard
- Power board
- Power inlet PCA
- Fans
- VRMs (12 V - 10 A, 5 V - 25 A, 3.3 V - 30 A, 2.5 V - 30 A)
- Host interface cards
- PCI carriers
- L1 controller display PCA
- PCI fillers
- Harness assemblies
- Cable assemblies
- Cable docks

## 2.6 X Brick

**Note:** The SGI SNIA 3000 series server does not support the X brick.

The X brick provides four half-height XIO slots that are compatible with the XIO slots of the Origin 2000 and Octane systems. It has two Crosstown2 ports that connect the X brick to a C brick and/or a G brick. The L1 controller selects one of two speeds for the Crosstown2 ports: 800 Mbyte/s or 1200 Mbyte/s.

The X brick requires 4 U of space within the rack (refer to Figure 2-37) and has the specifications that are listed in Table 2-7.

**Table 2-7** X-brick Specifications

| Characteristic | Specification |
|---|---|
| Height | 7.0 in. (177.80 mm) |
| Width | 17.5 in. (444.50 mm) |
| Depth | 27.5 in. (698.50 mm) |
| Weight | 60 lb (27.00 kg) |

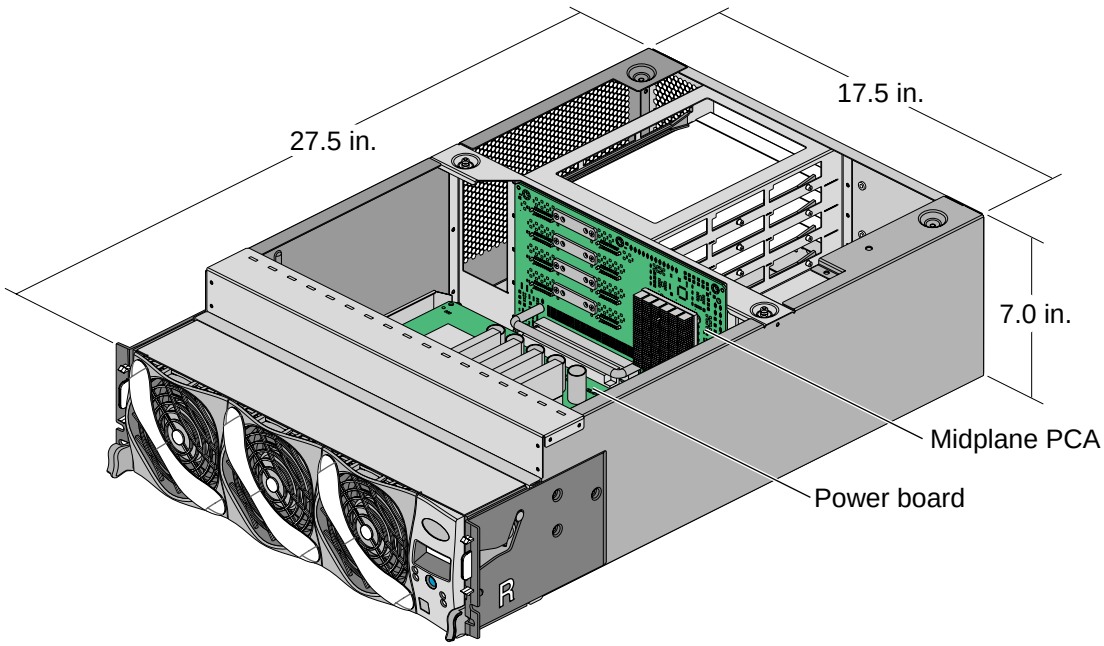



**Figure 2-37** Front View of X Brick

### 2.6.1 Components

The X brick contains the following components:

- Midplane PCA
- XIO cards
- Power board
- Host interface card
- L1 controller
- Fans

#### 2.6.1.1 Midplane PCA

The midplane PCA, which mounts vertically in the brick, contains an Xbridge ASIC that is the interface between two Crosstown2 ports of the X brick and the XIO cards (refer to Figure 2-38). The midplane PCA also has CPOP connectors that seat the XIO cards.

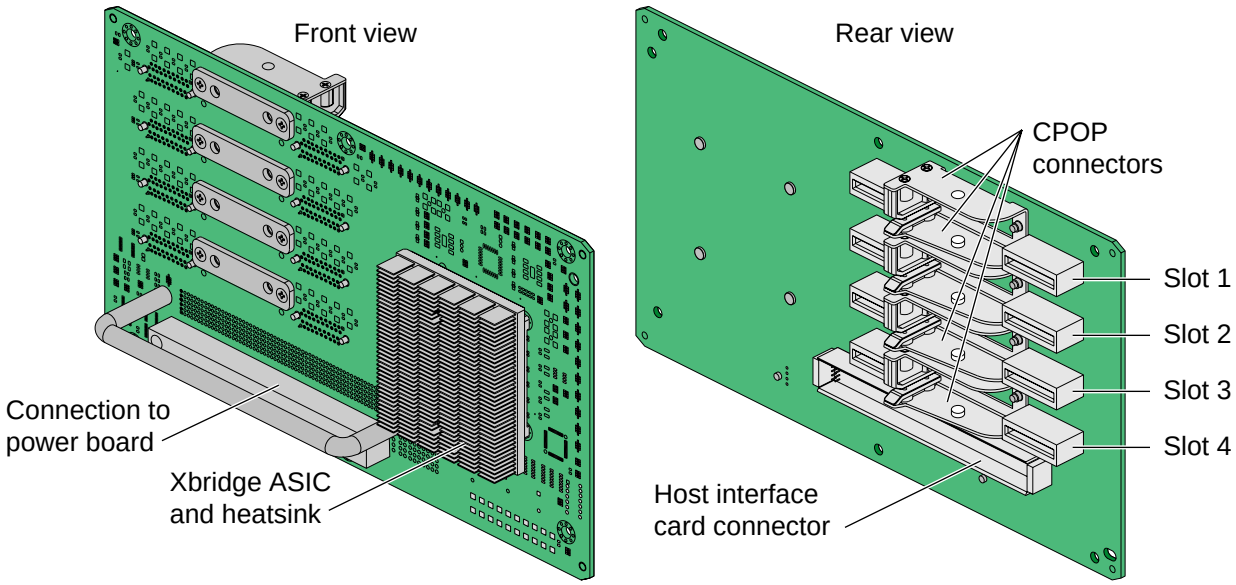



**Figure 2-38** Midplane PCA

### 2.6.1.2 XIO Cards

The XIO cards insert horizontally into slots of the X brick and connect to the midplane PCA. The XIO card slots are labeled Slots 1, 2, 3, and 4 (refer to Figure 2-38). Figure 2-39 shows an example of an XIO card.

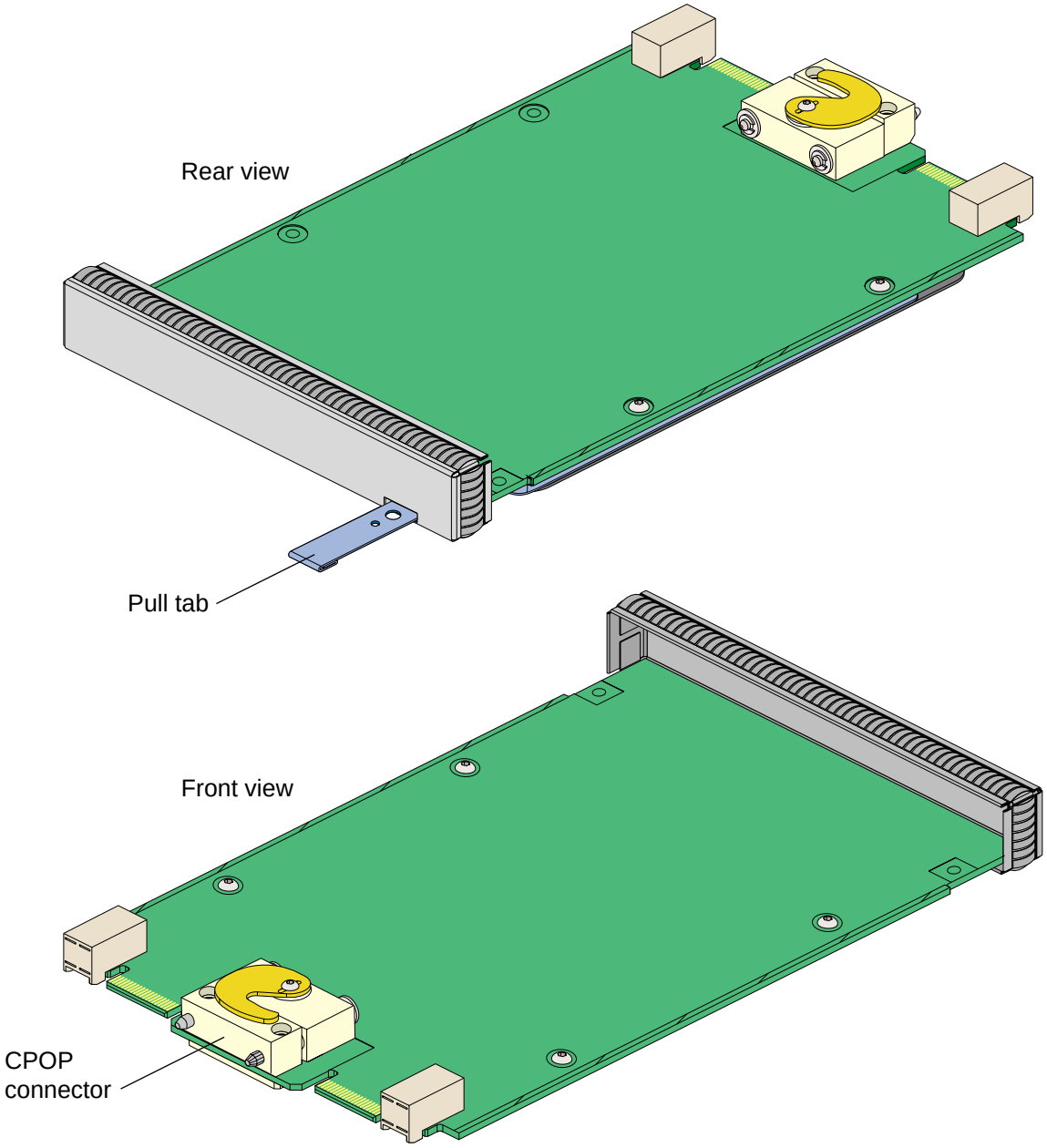



**Figure 2-39** XIO Card

### 2.6.1.3 Power Board

The power board installs horizontally in the front of the brick and connects to the midplane PCA (refer again to Figure 2-37). It contains the logic components of the L1 controller (refer to the orange-colored components in Figure 2-40), five VRMs, one DC-to-DC converter, and three voltage regulators. The VRMs, DC-to-DC converter, and voltage regulators convert the incoming 48 Vdc to voltage levels that the components within the brick require.

- One 12-Vdc, 10-A voltage regulator module (VRM 1)
- One 5-Vdc, 25-A voltage regulator module (VRM 2)
- Two 3.3-Vdc, 30-A voltage regulator modules (VRM 3 and VRM 4)
- One 2.5-Vdc, 30-A voltage regulator module (VRM 7)
- One 12-Vdc, 4.17-A DC-to-DC converter
- One 3.3-Vdc voltage regulator
- Two 5-Vdc voltage regulators

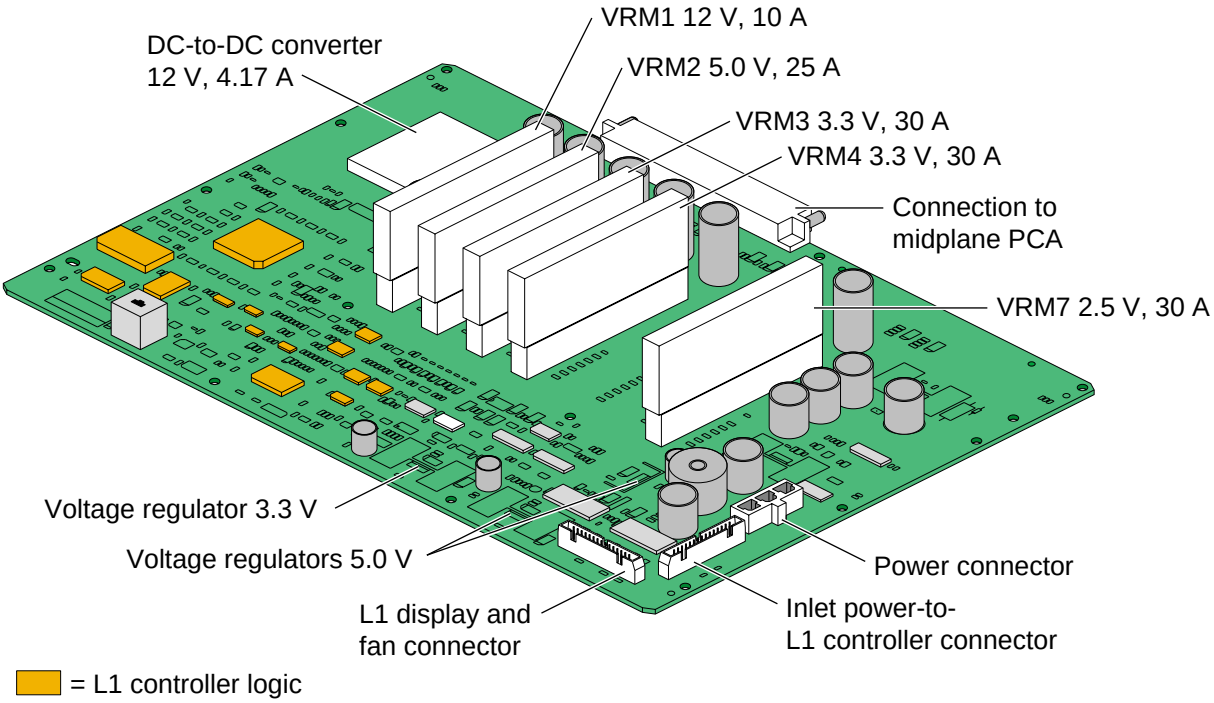



**Figure 2-40** X-brick Power Board

### 2.6.1.4 Host Interface Card (HIC)

The X brick uses one host interface card that contains two Crosstown2 connectors and a connection to the midplane PCA (refer to Figure 2-41). This card transfers signals between the Crosstown2 cables and the Xbridge ASIC on the midplane PCA.

In the brick, the host interface card is physically located below the XIO cards (refer to Figure 2-42). The Crosstown2 connectors are labeled XIO 10 and XIO 11 on the rear of the X brick (refer again to Figure 2-42).

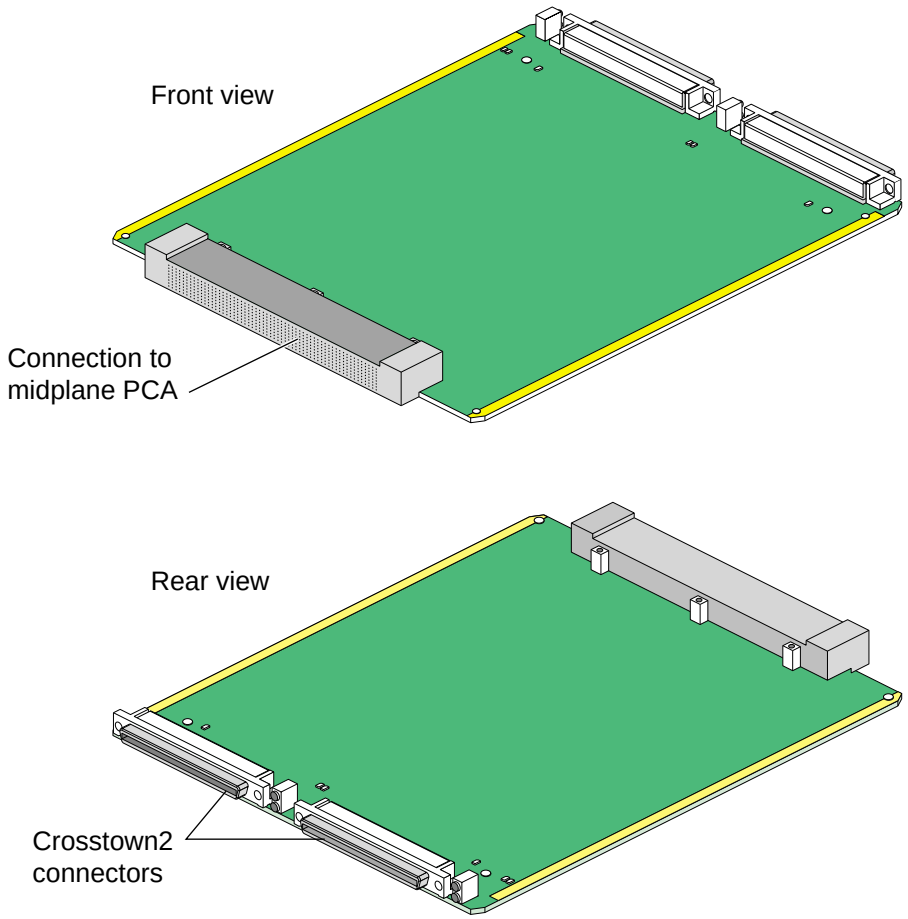



**Figure 2-41** X-brick Host Interface Card

#### 2.6.1.5 L1 Controller

The L1 controller monitors and controls the environment of the X brick. It consists of a display, logic components, and a cable. The display is located at the front of the brick. The logic components are located on the power board. The cable connects the display to the logic components (refer to Figure 2-42).

#### 2.6.1.6 Fans

The X brick is an air-cooled device; three fans, which are located at the front of the X brick, move air from the front of the rack, through the X brick, to the rear of the rack. These fans are redundant, can be hot swapped, and run at variable speeds.

### 2.6.2 FRUs

To perform most maintenance activities on the X brick, the X brick must be powered down; however, the system can remain powered up.

**Note:** You can replace a fan with the X brick powered up.

The X-brick FRUs include the following components:

- Midplane PCA
- XIO cards
- Host interface card
- Power board
- Input power PCA
- Fans
- VRMs (12 V - 10 A, 5 V - 25 A, 2.5 V - 30 A, 3.3 V - 30 A)
- L1 controller display PCA
- Harness assemblies
- Cable assemblies
- Cable docks

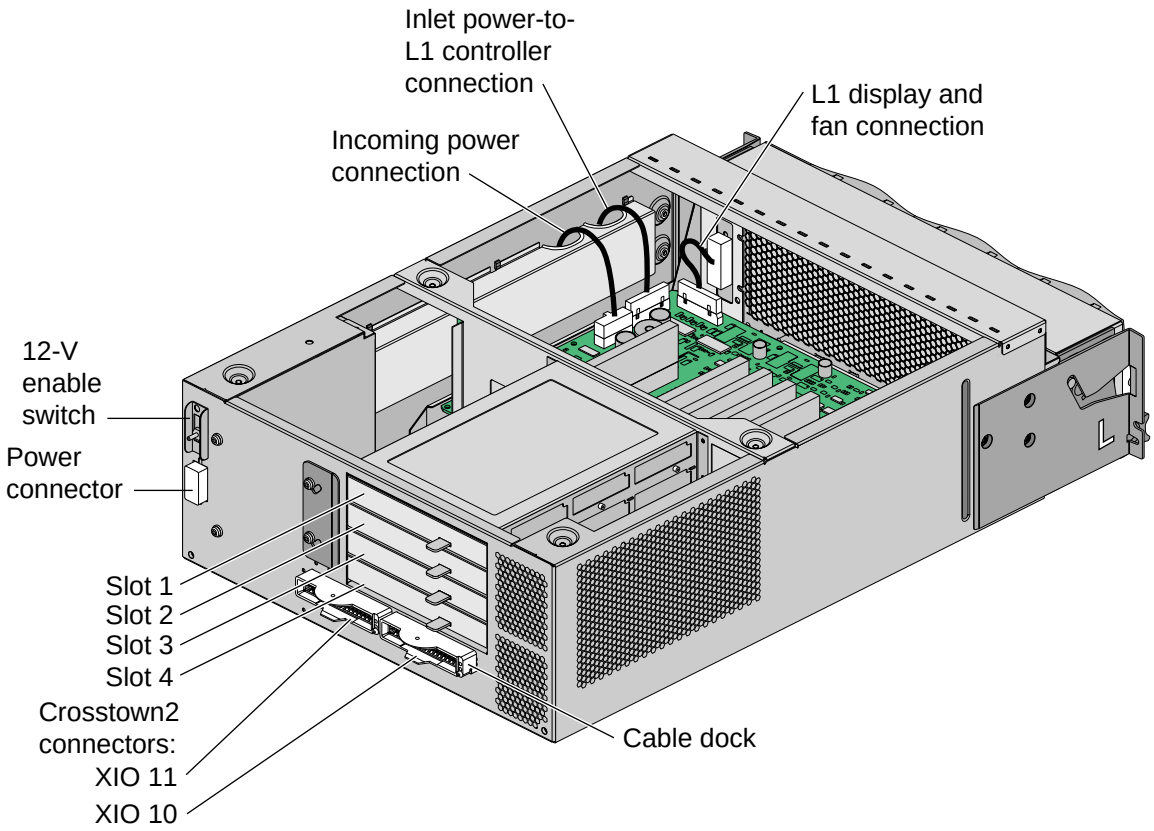



**Figure 2-42** Rear View of X Brick without the Top Panel

## 2.7 D Brick

The D brick is a rackmount enclosure that contains:

- Two to twelve disk drives (refer to Figure 2-43)
- Component modules that handle I/O, power, cooling, and operations (refer to Figure 2-44)
- Module fillers that are installed in unoccupied space within the enclosure to maintain proper airflow (refer again to Figure 2-44)

The D brick supports JBOD (just a bunch of disks) within an SGI SNIA 3000 series rack. For RAID (redundant array of independent disks) configurations, the SGI TP9100 and SGI TP9400 Fibre Channel storage systems are used.

The D brick requires 4 U of space within a rack and has the specifications that are listed in Table 2-8.

**Table 2-8** D-brick Specifications

| Characteristic | Specification |
|---|---|
| Height | 7.0 in. (177.80 mm) |
| Width | 19 in. (482.60 mm) |
| Depth | Approximately 27.74 in. (704.60 mm) |
| Weight (with drives) | Approximately 80 lbs (36.00 kg) |

The D-brick enclosure is four bays wide by three bays high. The bays are numbered 1 to 4 from left to right and 1 to 3 from top to bottom (refer to Figure 2-45).

**Note:** Drives in bays 1/3 and 4/3 are required for storage system management; these bays must always be occupied.

Depending on the system configuration, the D brick can reside in a short rack, a tall rack, or a D-brick rack. For more information about the short and tall racks, refer to Chapter 1 of this document. A D-brick rack is a tall rack (the same rack as the tall rack that is used for compute racks and I/O racks) that contains two to nine D bricks.

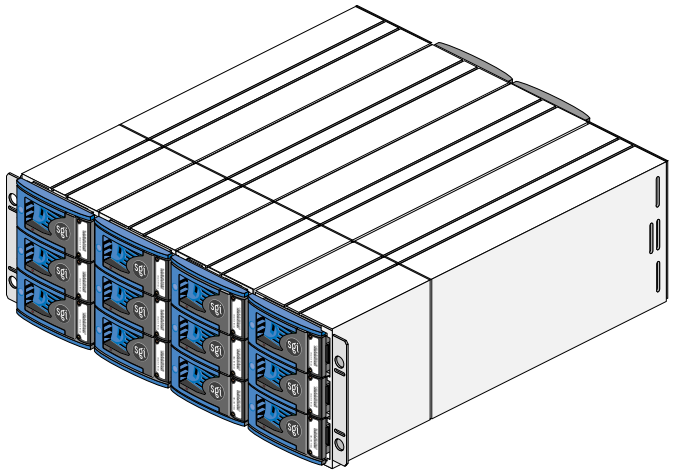


**Figure 2-43** Front View of D Brick

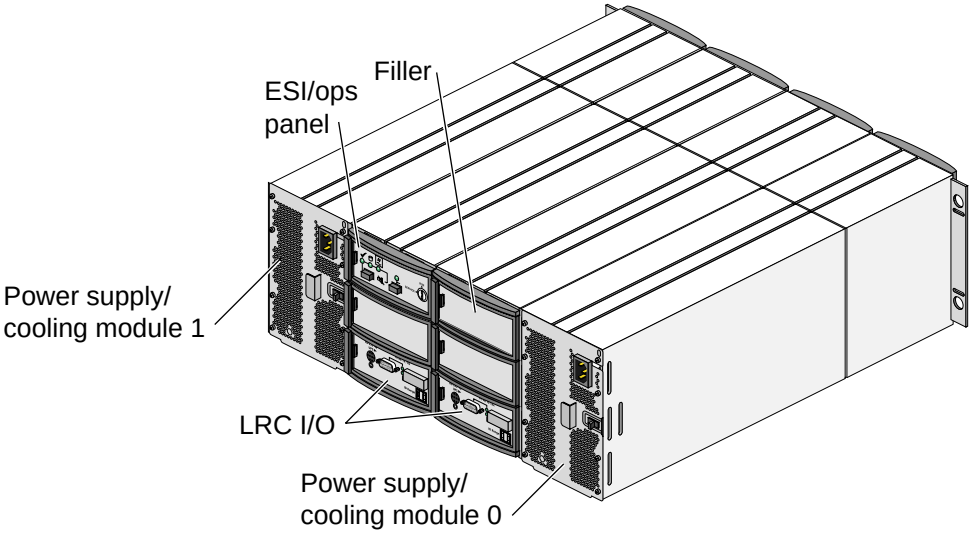



**Figure 2-44** Rear View of D Brick

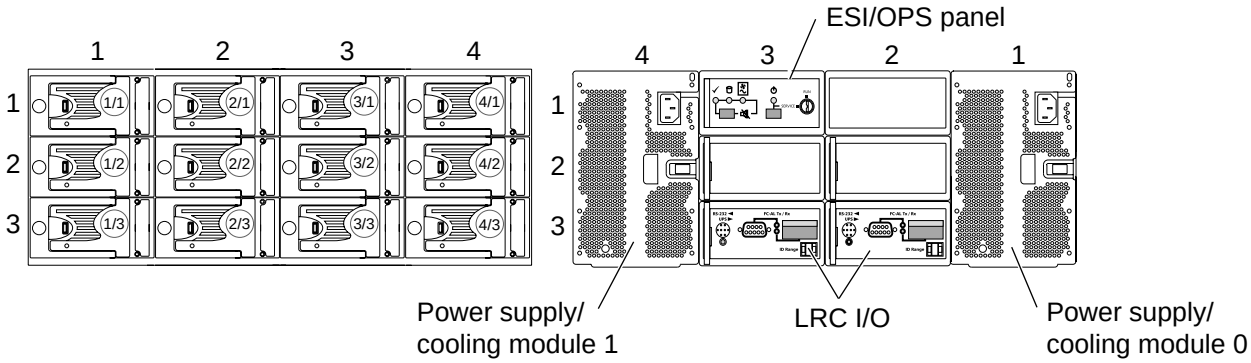



**Figure 2-45** Bay Locations

### 2.7.1 Components

The D brick contains the following modules:

- Two to 12 Fibre Channel disk drive carrier modules with 18-GB, 7200-RPM drives
- Two loop resiliency circuit (LRC) I/O modules
- Two power supply/cooling modules
- One enclosure system interface/operators panel (ESI/ops) module

### 2.7.1.1 Fibre Channel Disk Drive Carrier Modules

A Fibre Channel disk drive carrier module consists of a carrier, two LEDs, a tamper-resistant lock mechanism, and a disk drive (refer to Figure 2-46).

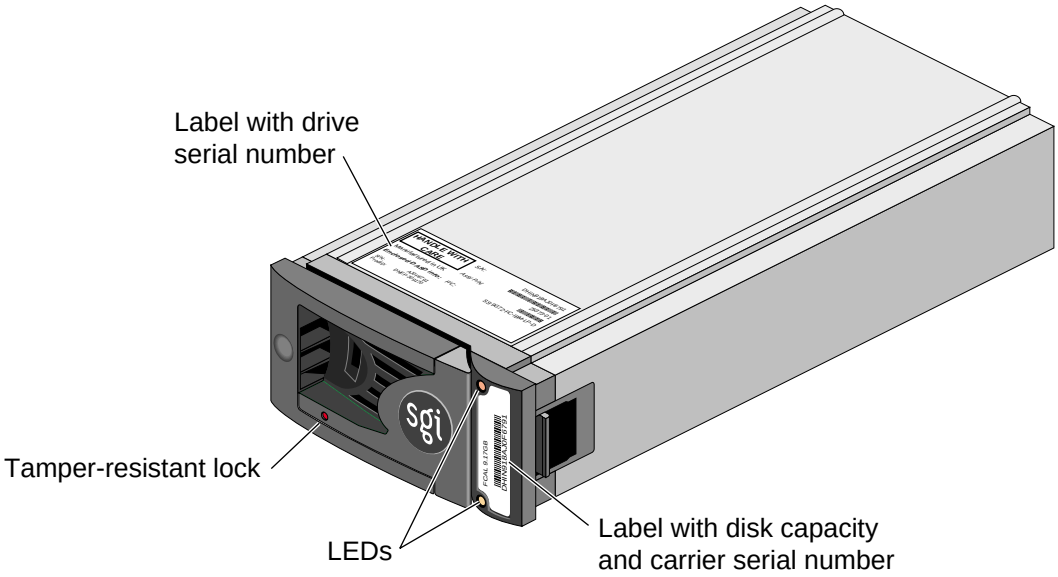



**Figure 2-46** Disk Drive Carrier Module

The carrier provides thermal conduction and protection against radio frequency and electromagnetic induction, and it protects the disk drive. It has two labels: the label that is located on the top of the carrier indicates the drive serial number and the label that is located on the front panel of the carrier indicates the disk capacity and carrier serial number.

The top LED, which is green, illuminates during normal operation; it indicates that the drive is on and it flickers when there is activity in the drive. The bottom LED, which is amber, illuminates when the drive fails.

The tamper-resistant lock locks the handle in place; therefore, the carrier cannot be removed from the enclosure. When the handle is locked, a red indicator is visible in the rectangular hole in the handle. When the drive is unlocked, a black indicator is visible. The tamper-resistant lock setting is changed with a key through a small round cutout in the lower part of the handle trim piece.

The disk drive has the specifications that are listed in Table 2-9.

**Table 2-9** Disk Drive Specifications

| Characteristic | Specification |
|---|---|
| Height | 1.6 in. (40.64 mm) |
| Width | 3.5 in. (88.90 mm) |
| Storage capacity | 9 or 18 Gbytes |
| Revolution per minute (RPM) | 7,200 RPMs |

### 2.7.1.2 FC-AL Loop Resiliency Circuit I/O Modules

Each enclosure contains two Fibre Channel arbitrated loop (FC-AL) loop resiliency circuit (LRC) I/O modules (refer to Figure 2-47) that provide dual (redundant) data paths; each I/O module provides a connection between two D bricks; for example, the receive port of one D brick is cabled to the transmit port of another D brick.

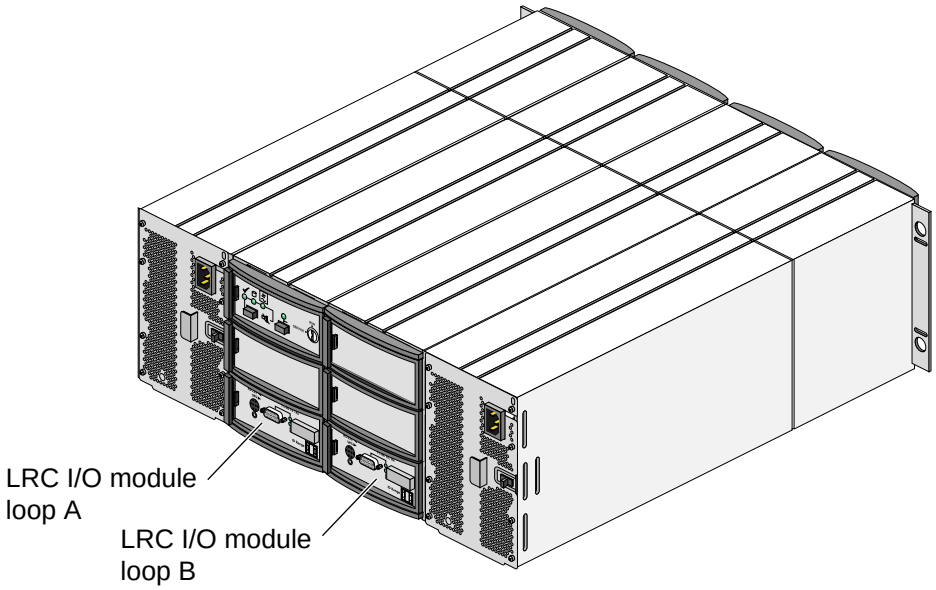



**Figure 2-47** I/O Module Locations

The panel of the I/O module has one RS-232 connector (not used), two DB-9 connectors, and two LEDs (refer to Figure 2-48). The top LED indicates the status of the left DB-9 connector and the bottom LED is for the right DB-9 connector. When an LED is green, the cable is connected properly. When an LED is amber, the connection is faulty.

The I/O module panel also has an identification (ID) range selector that selects an ID number of 1 to 7 for the D bricks within the system. For example, the ID range for both I/O modules in the lowest D brick in the rack is set to 7. The ID range for the I/O modules of the next D brick in the rack is set to 6 and so on.

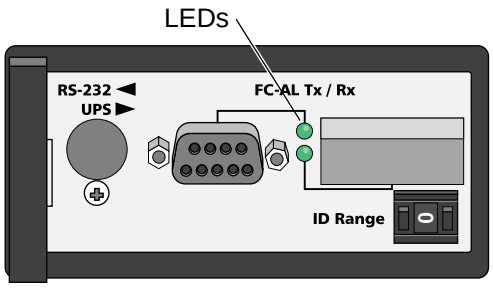



**Figure 2-48** I/O Module Panel

### 2.7.1.3 Power Supply/Cooling Modules

A power supply / cooling module contains two fans, the power supply, and its associated electronics. An LED on the front panel indicates the status of the power supply and fan (refer to Figure 2-49).

**Note:** The fan receives power from the chassis midplane, not from the power supply.

The D brick contains two power supply / cooling modules that operate together; if one fails, the other power supply / cooling module maintains the power and cooling while the faulty module is replaced.

The power supply / cooling module powers down the enclosure when the components within the enclosure exceed the temperature threshold.

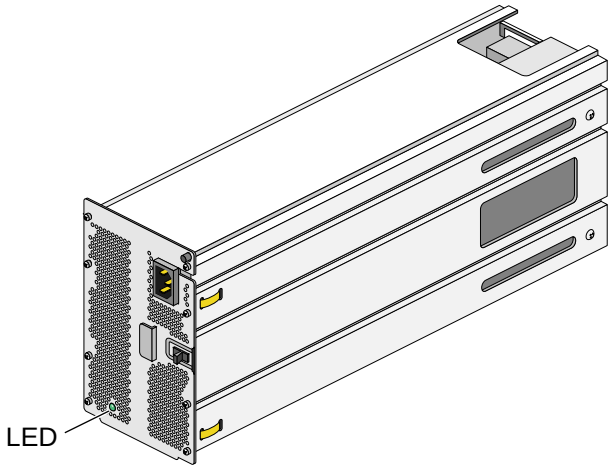



**Figure 2-49** Power Supply / Cooling Module

### 2.7.1.4 Enclosure System Interface/operators (ESI/ops) Panel Module

The ESI/ops panel module monitors and controls all elements of the storage system; for example, power, cooling, temperature, and device status (refer to Figure 2-50).

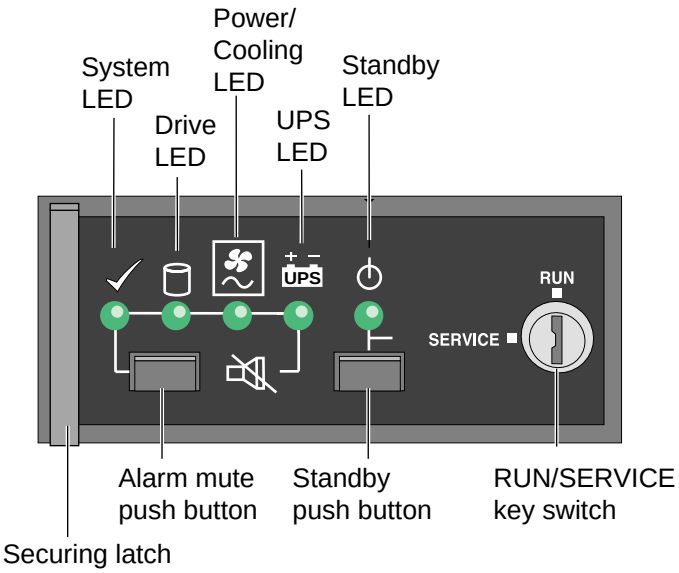



**Figure 2-50** ESI/ops Panel Module

This module communicates the system status via LEDs; the panel contains a system LED, a drive LED, a power/cooling LED, a UPS LED, and a standby LED. Refer to Table 2-10 for a description of the LEDs.

**Note:** SGI does not support UPS. In addition, all LEDs of the D brick use the illumination scheme that is described in Table 2-10.

**Table 2-10** LED Indications

| Illumination | Description |
|---|---|
| Green | Device is functioning properly |
| Blinking green | Data activity on disk drives |
| Blinking green and amber | Noncritical condition exists |
| Amber | Fault has occurred |

The ESI/ops panel also has a key switch and two push buttons: standby and alarm mute. The key switch activates run or service mode. The key switch should be in the RUN position for normal operations. SGI field personnel use the SERVICE position when the storage system is faulty. The standby button activates the standby mode when the key switch is in the SERVICE position. The alarm mute button reduces the volume of the alarm, which indicates a fault.

## 2.8 G Brick

**Note:** The SGI SNIA 3000 series server does not support the G brick.

The SGI Onyx 3000 graphics system is a two-pipe, rackmounted graphics interface that is contained in the G brick (refer to Figure 2-51). The G brick requires 18 U of space within a tall rack and has the specifications that are listed in Table 2-11.

**Note:** The short rack does not support the G brick.

**Table 2-11** G-brick Specifications

| Characteristic | Specification |
|---|---|
| Height | 31.5 in. (800.10 mm) |
| Width | 19.0 in. (482.60 mm) |
| Depth | 20.0 in. (508.00 mm) |
| Weight (maximum configuration) | 215 lb (96.75 kg) |

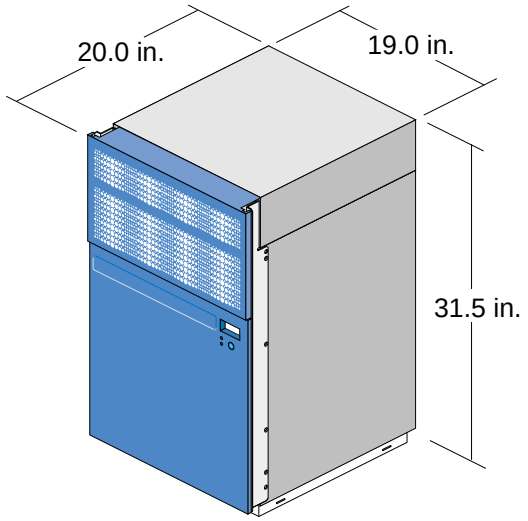



**Figure 2-51** Front View of G Brick

### 2.8.1 Components

The G brick contains:

- InfiniteReality, InfiniteReality2, or InfiniteReality3 board set

  **Note:** The InfiniteReality3 board set is the default board set for the SGI Onyx 3000 graphics system.

- L1 controller
- Power supply
- Midplane

#### 2.8.1.1 InfiniteReality3 Board Set

The InfiniteReality3 board set consists of the following board types:

- Ktown2
- GE16-4
- RM10
- DG5

#### 2.8.1.1.1 Ktown2 Board

The Ktown2 board, which is physically located between the two pipes, provides two Crosstown2 (Xtown2) connections; the top Crosstown2 connector is for the right pipe; the bottom Crosstown2 connector is for the left pipe (refer to Figure 2-52 and Figure 2-53).

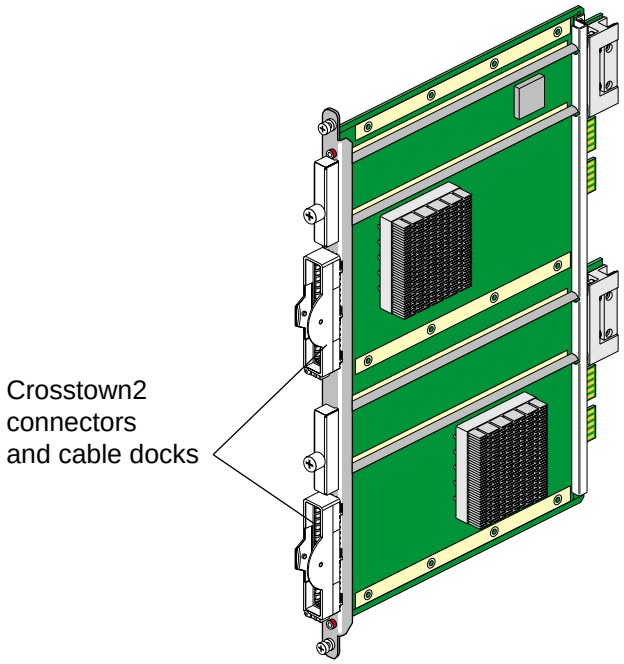



**Figure 2-52** Ktown2 Board

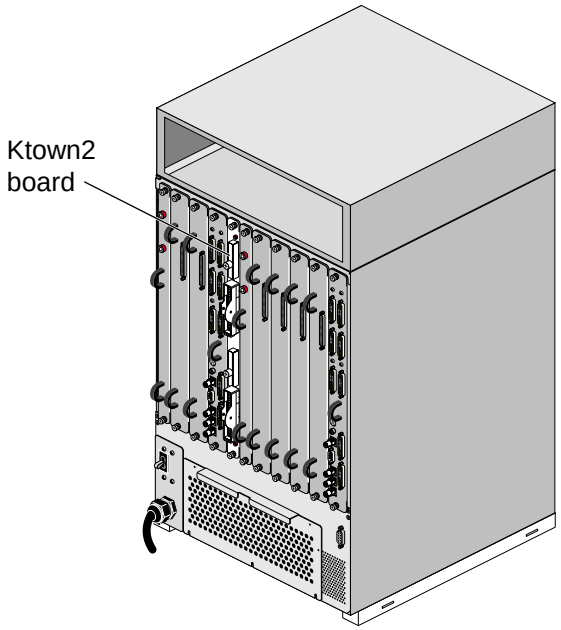



**Figure 2-53** Ktown2 Board Location within G Brick

#### 2.8.1.1.1 GE16-4 Board

The GE16-4 board contains four processors that process OpenGL commands and vertex data that it receives from the host processors (refer to Figure 2-54). Each pipe contains one GE16-4 board (refer to Figure 2-55).

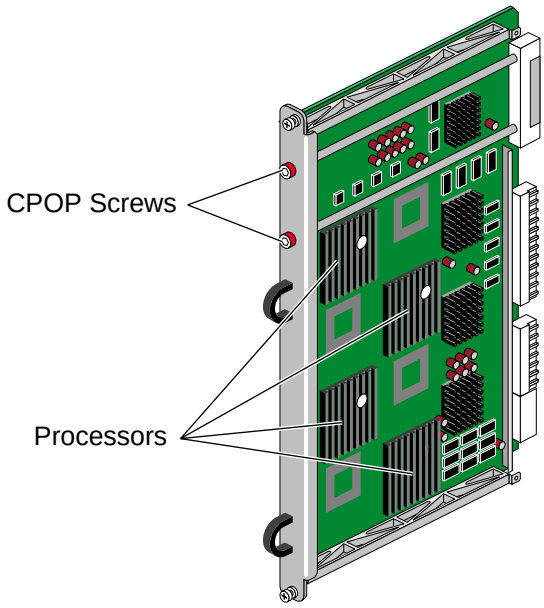



**Figure 2-54** GE16-4 Board

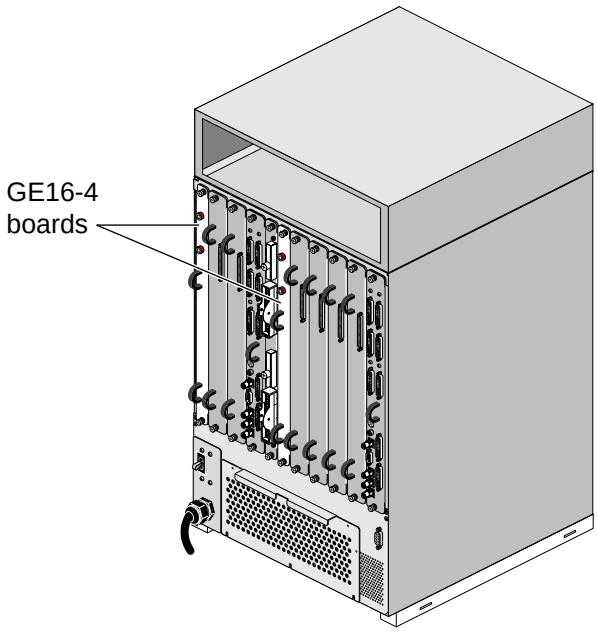



**Figure 2-55** GE16-4 Board Locations within G Brick

#### 2.8.1.1.1 RM10 Boards

The RM10 boards (refer to Figure 2-56) contain the main memory of the graphics system. The left pipe provides slots for up to two RM10 boards. The right pipe provides slots for up to four RM10 boards (refer to Figure 2-57). The RM10 also contains texture memory (TM), which contains textures that can be applied to images.

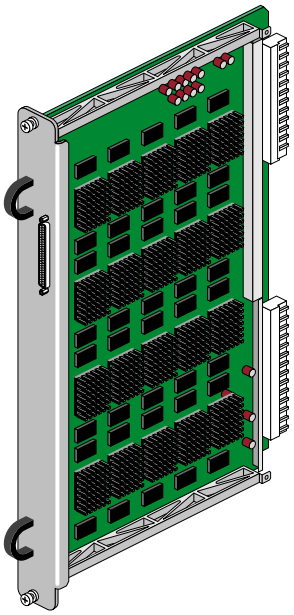


**Figure 2-56** RM10 Board

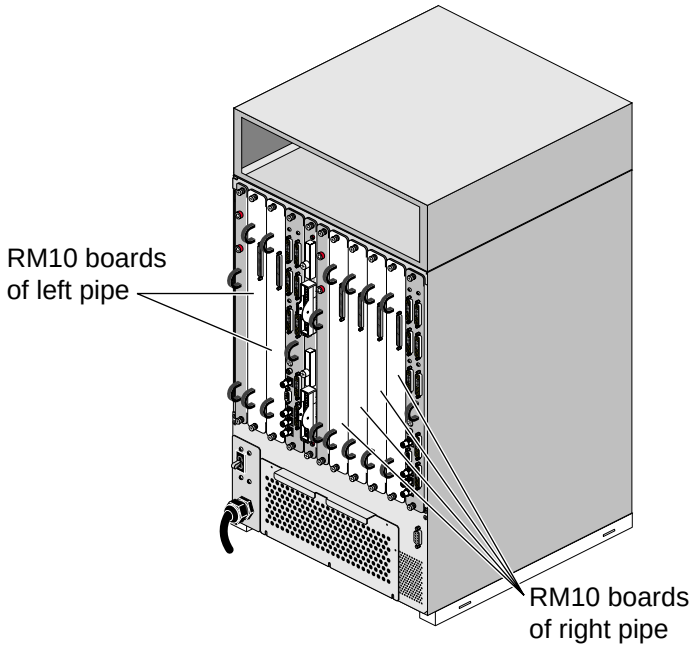



**Figure 2-57** RM10 Board Locations within G Brick

#### 2.8.1.1.1 DG5 Board

The DG5 board (refer to Figure 2-58) formats images so that they can be displayed on a monitor or delivered to other devices. Each pipe contains one DG5 board (refer to Figure 2-59).

**Note:** There are four versions of the DG5 board: DG5-2, DG5-8, DG5-GVO, and DG5-DPLEX.

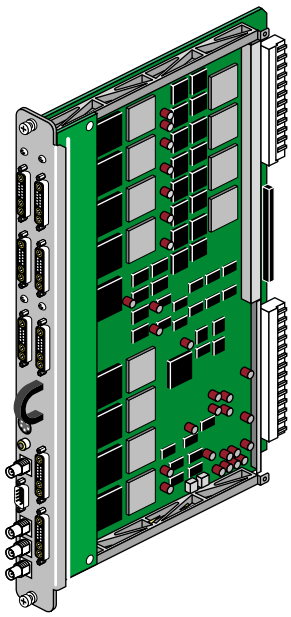


**Figure 2-58** DG5-8 Board

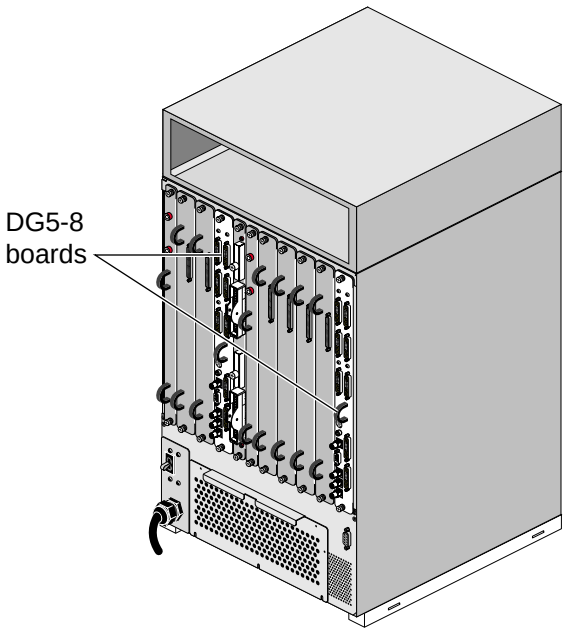



**Figure 2-59** DG5-8 Board Locations within G Brick

### 2.8.1.2 L1 Controller

The L1 controller performs various functions for the G brick; for example, the L1 controller monitors the voltage and temperature of the G brick. The L1 controller display is located on the front of the G brick (refer to Figure 2-60). The L1 controller logic resides on a board that is located behind the upper facade (refer to Figure 2-61).

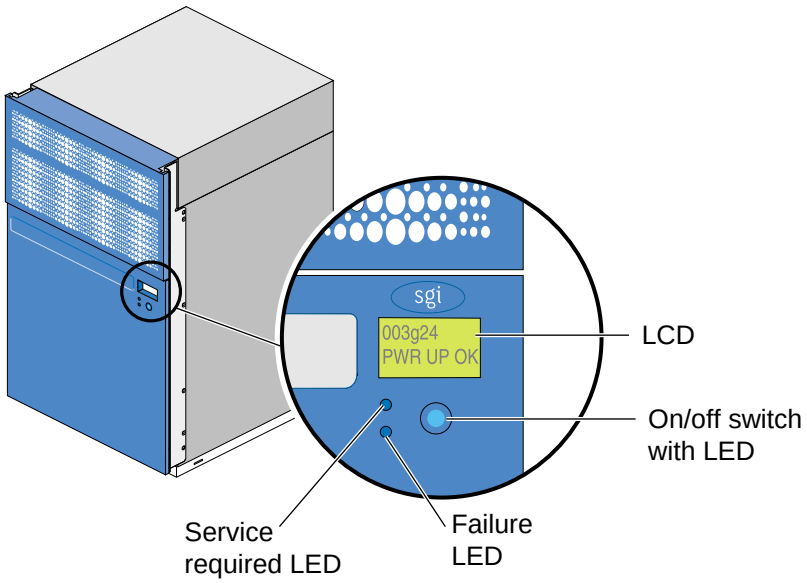



**Figure 2-60** L1 Controller Display, Switch, and LEDs

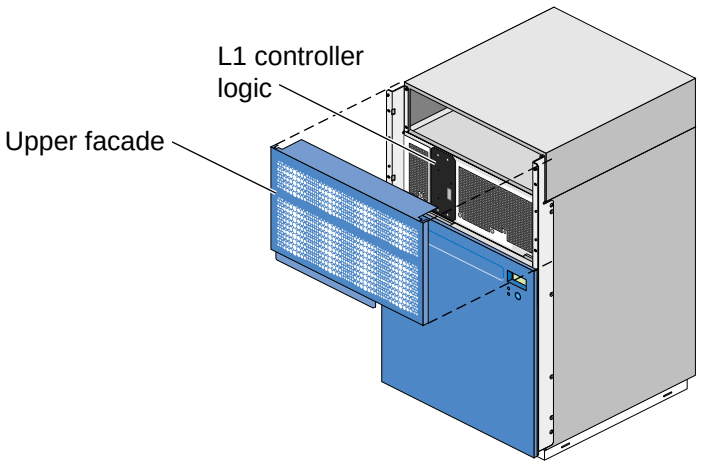



**Figure 2-61** Location of L1 Controller Logic

### 2.8.1.3 Midplane

The midplane provides connections for the board set (back side) (refer to Figure 2-62) and for the power supply and L1 controller (front side).

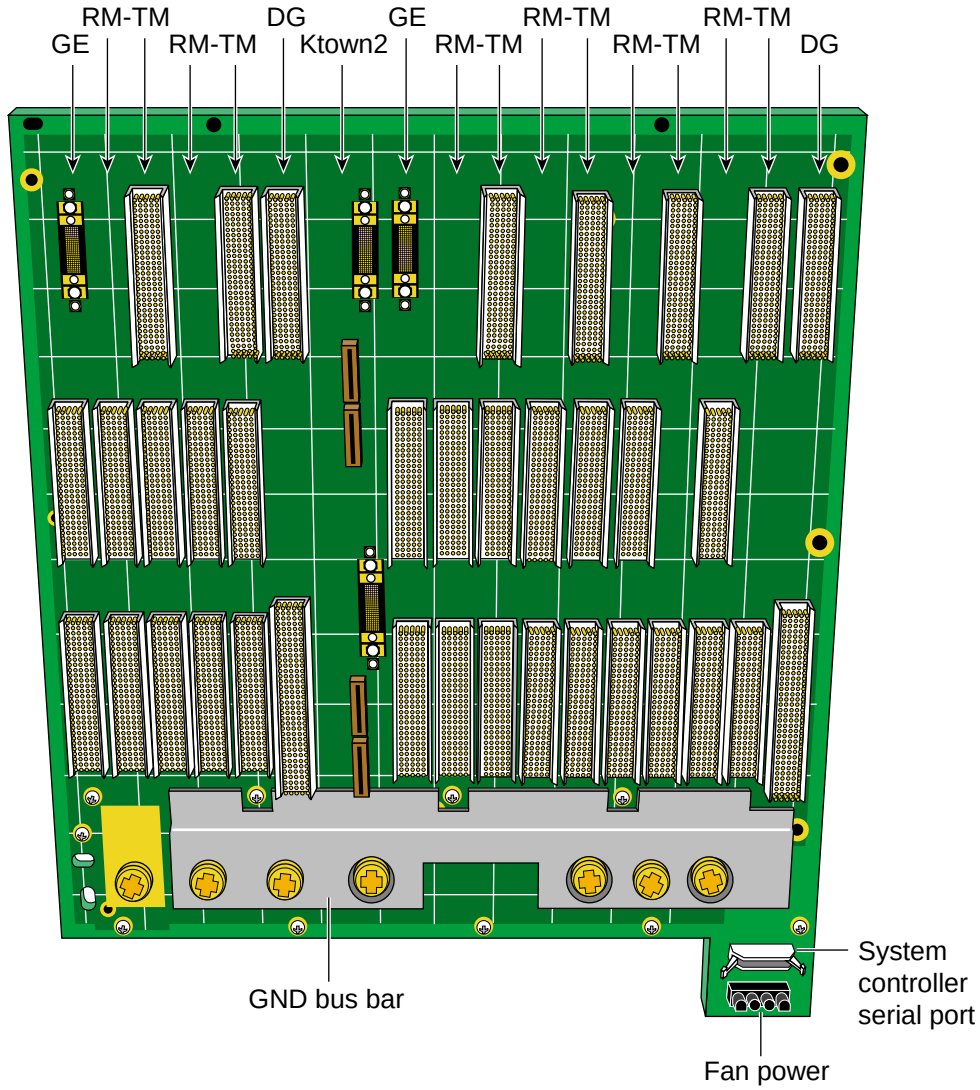



**Figure 2-62** Back Side of Midplane

### 2.8.1.4 Power Supply

The G brick has its own power supply, which requires a separate power outlet. The power supply is located on the front side of the midplane (refer to Figure 2-63).

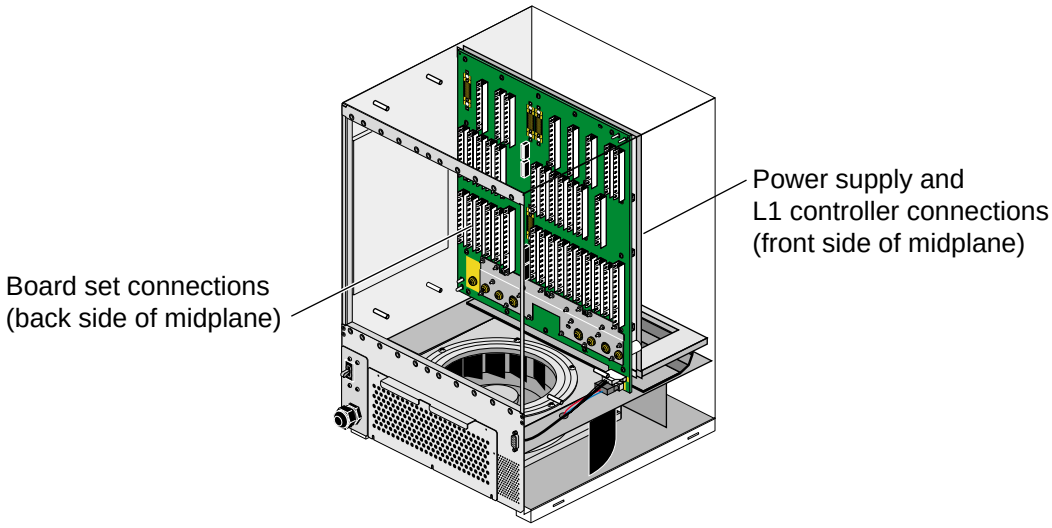



**Figure 2-63** Power Supply Connection to Midplane

### 2.8.1.5 Other Standard Components

The SGI Onyx 3000 graphics system also contains the following standard components:

- Radical PCI card that provides Audio Engineering Society (AES) digital audio input and output
- Genelec bi-amplified speakers that support both analog and AES digital inputs
- 24-inch SuperWide graphics monitor
- USB keyboard and mouse set

### 2.8.2 FRUs

To perform maintenance activities on the G brick, the G brick must be powered down.

The G-brick FRUs include the following components:

- Ktown2 board
- GE16-4 board
- RM10 board
- DG5 board
- Power supply
- Midplane
- Fan assembly
- L1 controller display PCA

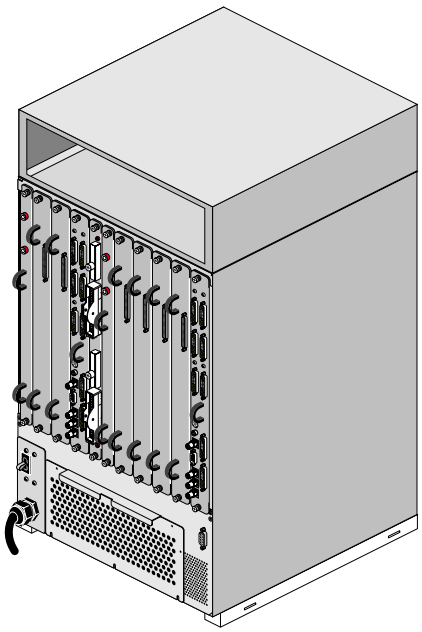


**Figure 2-64** Rear View of G Brick

*Chapter 3*

# Power Components

**Note:** For information that applies to both the SGI Origin 3000 and SGI SNIA 3000 series servers, the name 3000 series servers is used throughout this document.

The 3000 series servers use the following power components:

- Power distribution units (PDUs)
- Power bays
- Auxiliary power strips

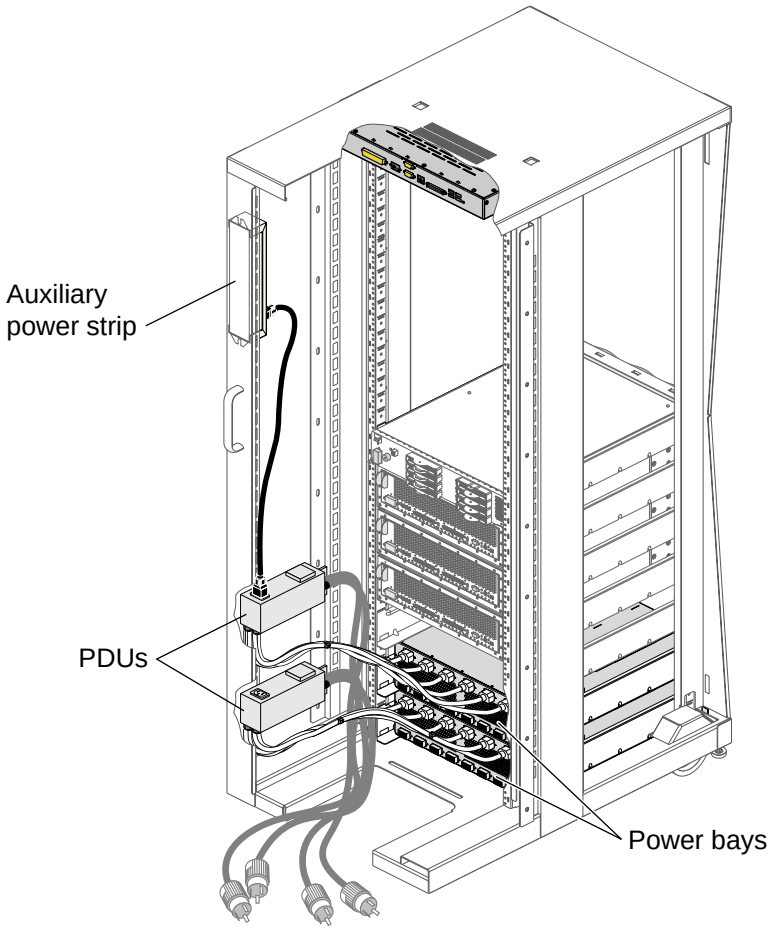



**Figure 3-1** Power Components within a Rack

## 3.1 Power Distribution Units (PDUs)

The Origin 3400, Origin 3800, SNIA 3400, and SNIA 3800 servers support both single- and three-phase power. A system that uses single-phase power requires one single-phase PDU for each power bay (refer to Figure 3-2). A system that uses three-phase power requires one three-phase PDU per rack (refer to Figure 3-3).

**Note:** The Origin 3200 and SNIA 3200 servers support only single-phase power. These systems receive this power via an auxiliary power strip, not a PDU.

Both types of PDUs provide the following three functions:

- Filter input power
- Protect against over-current conditions
- Remove power from a rack

The PDUs have the specifications that are listed in Table 3-1.

**Table 3-1** PDU Specifications

| Characteristic | Specification |
|---|---|
| Height | 4 in. (101.60 mm) |
| Width | 5 in. (127.00 mm) |
| Depth | 10 in. (254.00 mm) |

### 3.1.1 Components

The single-phase PDU consists of:

- Two input power cords and connectors
- Six output cords that connect to one power bay
- One four-pole circuit breaker that is rated 30 A, 250 V
- One power receptacle that is rated 10/15 A, 200 - 240 Vac; an auxiliary power strip plugs into this receptacle

The three-phase PDU consists of:

- One input power cord and connector
- Twelve output cords that connect to two power bays
- One four-pole circuit breaker that is rated 30 A, 250 V
- One power receptacle that is rated 10/15 A, 200 - 240 Vac; an auxiliary power strip plugs into this receptacle

### 3.1.2 FRUs

The PDU is a FRU.

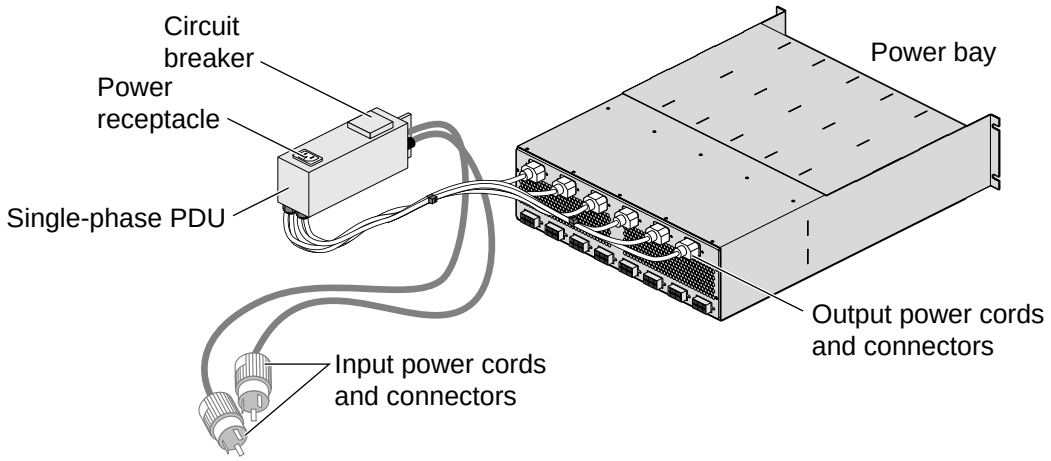



**Figure 3-2** Single-phase PDU

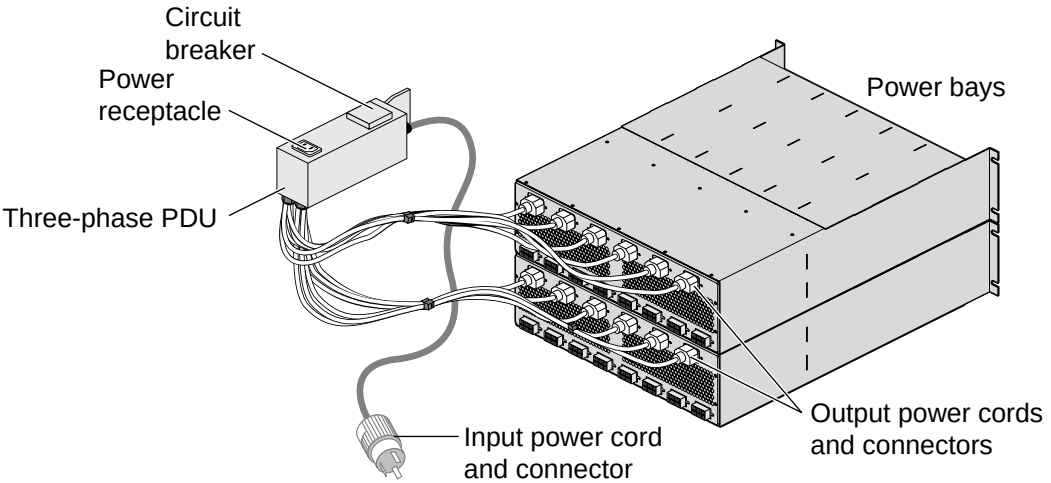



**Figure 3-3** Three-phase PDU

## 3.2 Power Bay

The power bay supplies AC power to six distributed power supplies; it also monitors and controls the power supplies. The power bay requires 3 U of space within the rack (refer to Figure 3-4) and has the specifications that are listed in Table 3-2.

**Table 3-2** Power Bay Specifications

| Characteristic | Specification |
|---|---|
| Height | 5.1 in. (129.54 mm) |
| Width | 17.5 in. (444.50 mm) |
| Depth | 24.5 in. (622.30 mm) |
| Weight (fully populated) | 72 lb (32.40 kg) |

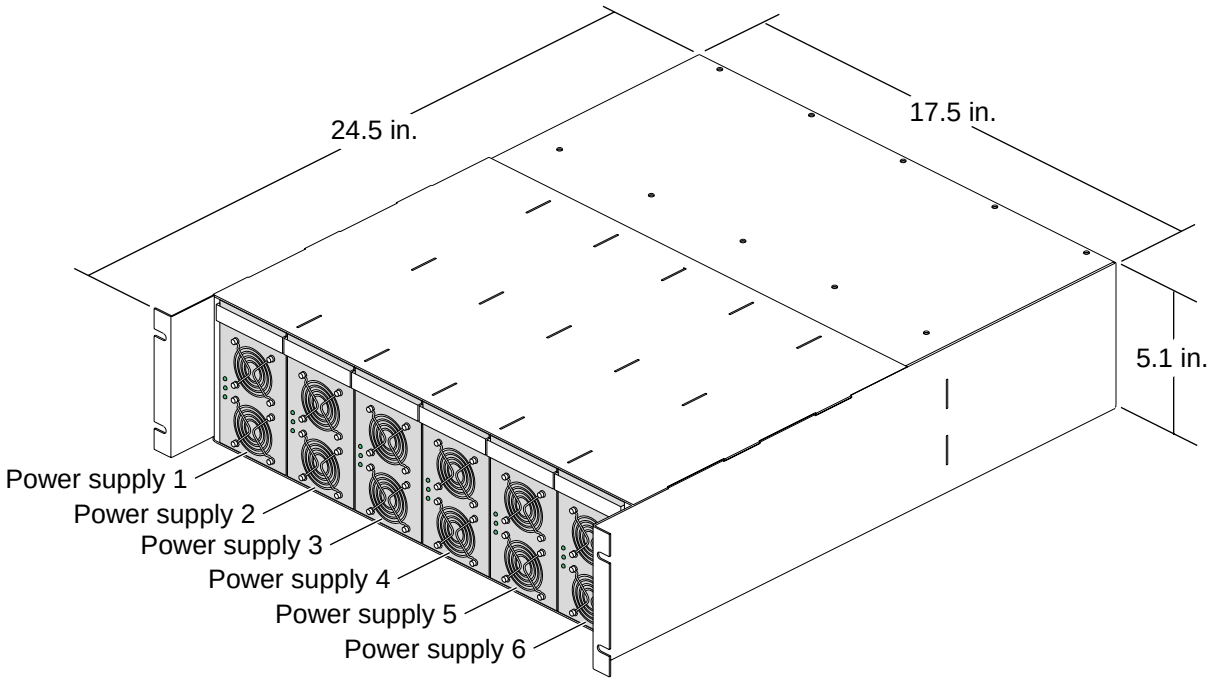



**Figure 3-4** Front View of Power Bay

## 3.2.1 Components

The power bay contains the following components:

- Distributed power supplies (DPSs)
- Output connectors
- Power bay motherboard

### 3.2.1.1 Distributed Power Supplies

The power bay can seat up to six distributed power supplies that insert from the front of the rack. Table 3-3 lists the specifications of the power supplies. Figure 3-4 identifies the power supplies within the power bay.

Each supply inputs single-phase AC and outputs 950 W at 48 Vdc. The outputs are bused together to provide 4,750 W of available power in an N+1 redundant configuration.

A minimum of two supplies must be present to provide redundant 48-Vdc power. The number of additional power supplies depends on the system type. For example, the power bay of the SGI Origin 3200 server contains three power supplies (DPSs 4, 5, and 6). For SGI SNIA 3400 servers, each power bay of the compute rack contains six power supplies and the power bay of each I/O rack contains four power supplies (DPSs 3, 4, 5, and 6).

**Table 3-3** Power Supply Specifications

| Characteristic | Specification |
|---|---|
| Height | 5 in. (127.00 mm) |
| Width | 2.8 in. (71.12 mm) |
| Depth | 13 in. (330.20 mm) |
| Weight | 7.5 lb (3.38 kg) |

The power supplies are air-cooled devices; each power supply has two fans that move air from the front of the rack to the rear of the rack (refer to Figure 3-5).

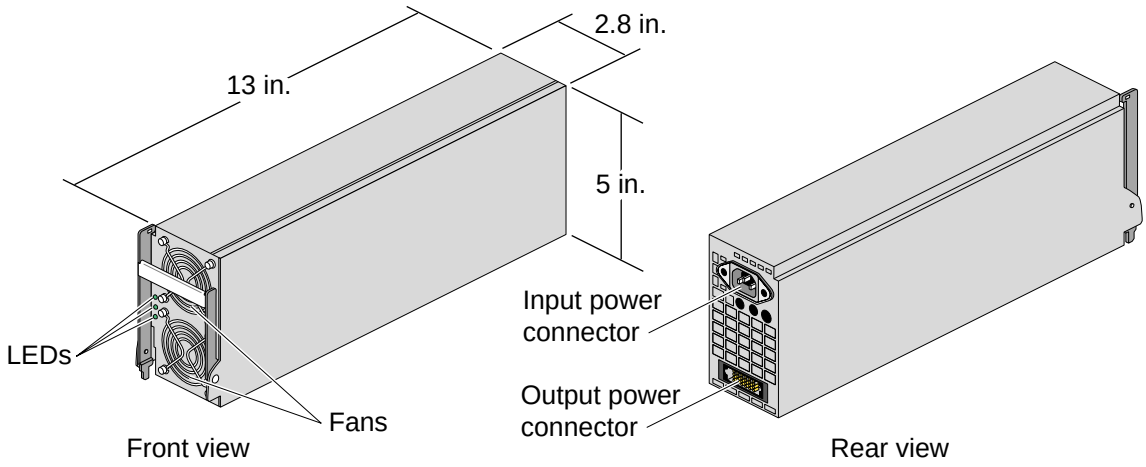



**Figure 3-5** Power Supply

Each power supply has three LEDs:

- Power
- Predictive fail (PFAIL)
- Power supply fail (FAIL)

Table 3-4 lists conditions of the power supplies and the corresponding states of the LEDs.

**Table 3-4** Power Supply LED States

| | LED States | | |
|---|---|---|---|
| **Power Supply Condition** | **Power (Green)** | **PFAIL (Amber)** | **FAIL (Amber)** |
| AC voltage not applied to all power supplies | Off | Off | Off |
| AC voltage not applied to this power supply | Off | Off | On |
| AC voltage present; standby voltage on | Blinking | Off | Off |
| Power supply DC outputs on | On | Off | Off |
| Power supply failure | Off | Off | On |
| Current limit reached on 48-Vdc output | On | Off | Blinking |
| Predictive failure | On | Blinking | Off |

Each power supply also contains a serial ID EEPROM that identifies the model and serial number of the supply. The L1 controller of a connecting brick reads this information via an $I^2C$ bus, which is part of the DC power cable.

### 3.2.1.2 Output Connectors

The power bay has eight output connectors (refer to Figure 3-6). A power cord connects an output connector to a brick. This connection provides 12 Vdc, 48 Vdc, and monitoring signals to the brick.

**Note:** The L1 controller of a connecting brick can monitor the status of the power bay; however, it cannot control the power bay.

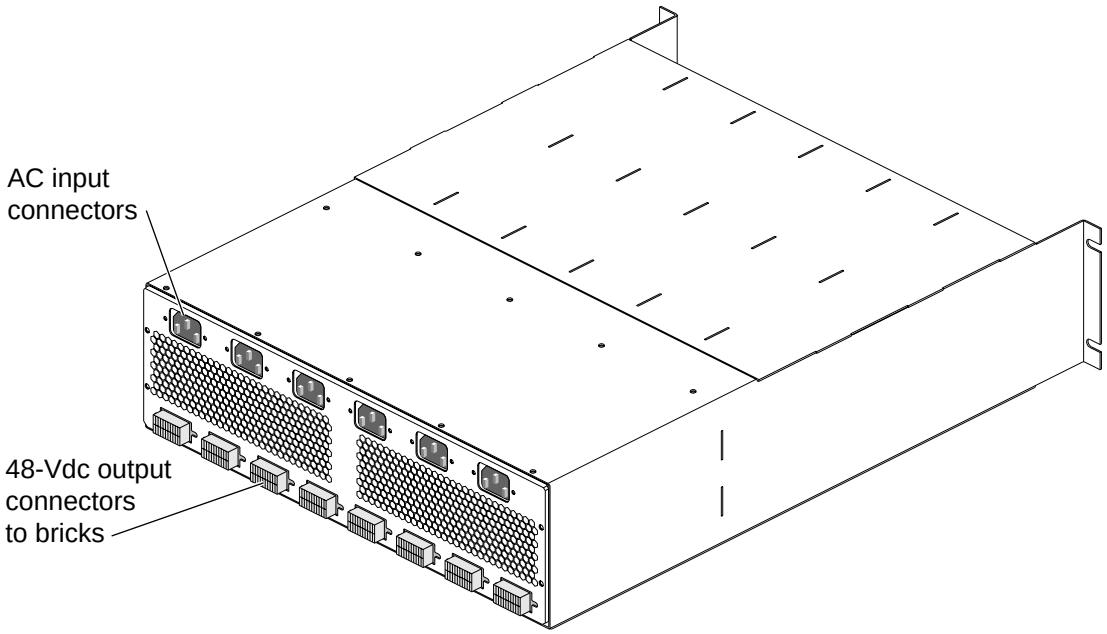



**Figure 3-6** Rear View of Power Bay

### 3.2.1.3 Power Bay Motherboard

The power bay motherboard (refer to Figure 3-7) connects the power supplies to the connectors at the rear of the power bay enclosure; it serves as the power bus that buses the six power supplies together to produce 48 Vdc and 12 Vdc. The power bay motherboard also:

- Contains overcurrent protection circuits for each power port.
- Filters the DC voltage.
- Seats the system management card.

  The system management card is the control system for the power bay. It contains the logic that powers on and off the power supplies and ports and a serial ID EEPROM that indicates the model and serial number of the unit. The L1 controller uses the RS-485 signals of the DC power cables to read this PROM.

  The system management card also performs the following functions:

  - Interfaces with the L1 controllers
  - Provides a communication link between the power supplies and the power bay
  - Monitors faults
  - Provides access to FRU data for the power bay and power supplies

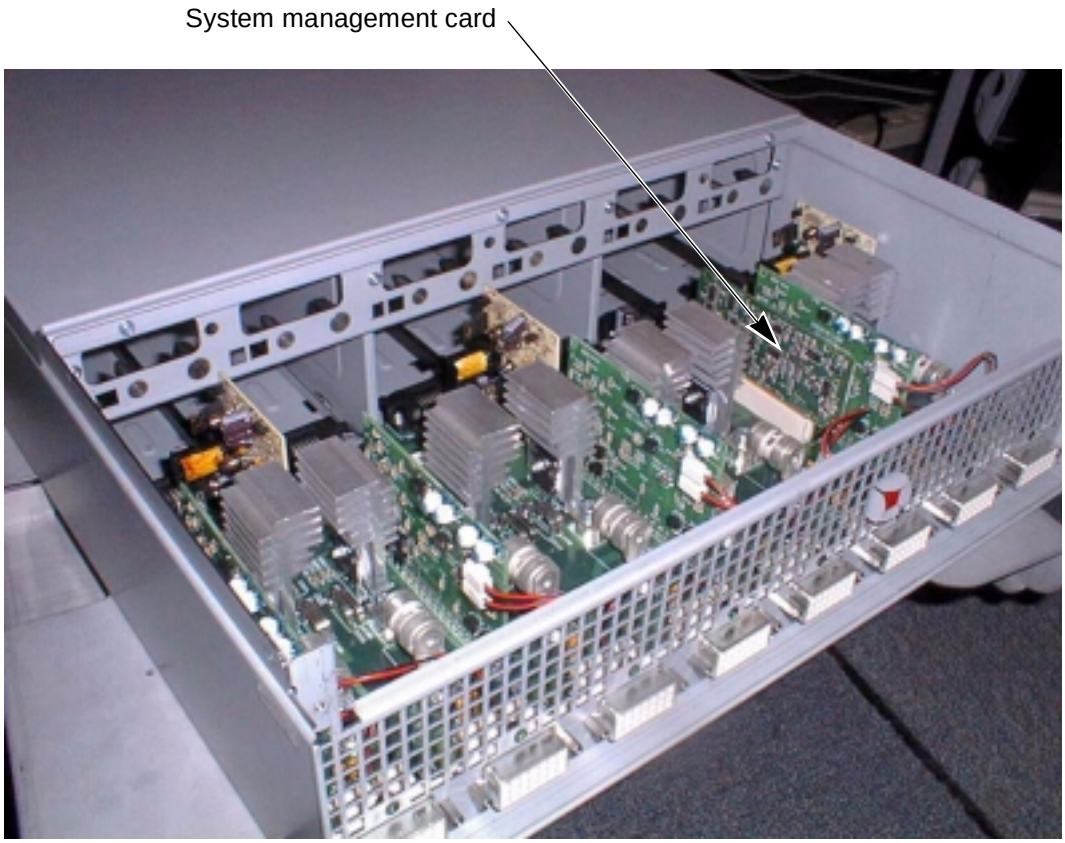



**Figure 3-7** Power Bay Motherboard

### 3.2.2 FRUs

The power bay FRUs include the following components:

- Empty power bay
- Power supplies
- System management card
- Power bay fuse
- Power cords

## 3.3 Auxiliary Power Strip

The Origin 3200 and SNIA 3200 servers use one auxiliary power strip to supply power to all components. The Origin 3400, Origin 3800, SNIA 3400, and SNIA 3800 servers use auxiliary power strips to supply power to the following components:

- D bricks
- Ethernet hub
- Cisco router
- Modem
- USB hubs

For Origin 3400, Origin 3800, SNIA 3400, and SNIA 3800 servers, the power strip receives power from a PDU. For Origin 3200 and SNIA 3200 servers, it receives power from an external source.

The auxiliary power strip has the specifications that are listed in Table 3-5.

**Table 3-5** Power-strip Specifications

| Characteristic | Specification |
|---|---|
| Height | 12 in. (304.80 mm) |
| Width | 2.5 in. (63.50 mm) |
| Depth | 3.5 in. (88.90 mm) |

### 3.3.1 Components

The auxiliary power strip has six output power receptacles, one input power receptacle, and one 10-A circuit breaker (refer to Figure 3-8). This power strip has a rating of 200 - 250 Vac.

### 3.3.2 FRUs

The power strip is a FRU.

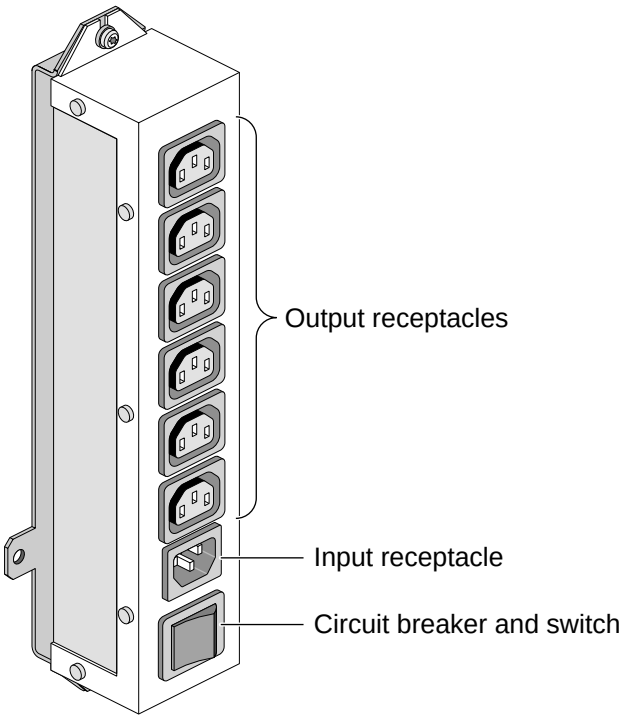



**Figure 3-8** Auxiliary Power Strip

*Chapter 4*

# System Controllers

**Note:** For information that applies to both the SGI Origin 3000 and SGI SNIA 3000 series servers, the name 3000 series servers is used throughout this document.

The 3000 series servers have three controllers: level 1 (L1), level 2 (L2), and level 3 (L3). The L1 controller is a brick-level controller that resides in the C, R, I, P, X, and G bricks. The L2 controller is a rack-level controller that resides in a compute rack. The L3 controller is a system-level controller; it is a Linux software package that resides on a Silicon Graphics 230 visual workstation.

The L2 controller is optional in the Origin 3200 and SNIA 3200 servers; however, it is required in the Origin 3400, Origin 3800, SNIA 3400, and SNIA 3800 servers. The L3 controller is optional in all 3000 series servers.

## 4.1 L1 Controller

The L1 controller performs many functions; for example, it controls voltage regulator modules (VRMs), monitors and reports failures, distributes boundary scan information, and controls and monitors fan speed. For information about all of the L1 controller functions, refer to the *System Controllers* document, publication number 108-0241-001.

### 4.1.1 Components

The L1 controller consists of the following components:

- User interface (display with switches and LEDs)
- Logic components
- Display cable and other connections

#### 4.1.1.1 User Interface

The L1 controller has a user interface that allows you to control and monitor the bricks. The user interface consists of (refer to Figure 4-1):

- A 2-line, 12-character liquid crystal display (LCD) that provides:
  - Brick identification
  - System status
  - Warning of required service or failure
- Three momentary switches: On / Off, NMI, and Reset

  **Note:** The NMI and Reset switches are used only by the C brick.
- Three status LEDs: System On, Service Required, and Failure

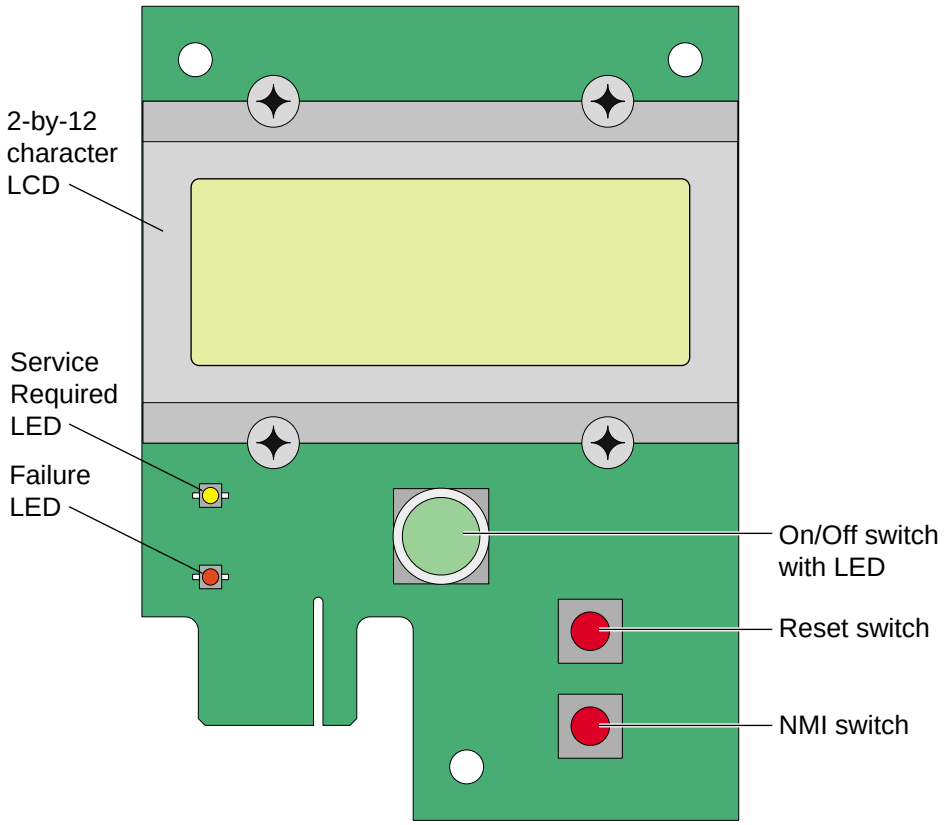



**Figure 4-1** User Interface

#### 4.1.1.2 Logic Components

The L1 controller consists of several logic components; for example, a microcontroller (MCU), flash memory, ID EEPROM, and NVRAM. In the R, I, P, and X bricks, these logic components are located on the power board. In the Origin 3000 series C brick, the logic of the L1 controller resides on the IP35 motherboard. In the SNIA 3000 series C brick, the logic of the L1 controller resides on the IP37 board. In the G brick, the L1 controller logic resides on a controller board.

#### 4.1.1.3 Display Cable and Other Connections

The L1 controller has a display cable that connects the user interface to the logic components of the L1 controller.

The L1 controller also has the following connections (refer to Figure 4-2):

- The L1 controller of a C brick connects to the USB hub of an R brick via the USB signals of the NUMAlink 3 cable.
- The G brick and the USB hub of the R brick connect to the L2 controller via the USB port cable.
- The L1 controller of an I/O brick connects to a C brick via the RS-422 signals in the Crosstown2 cable.

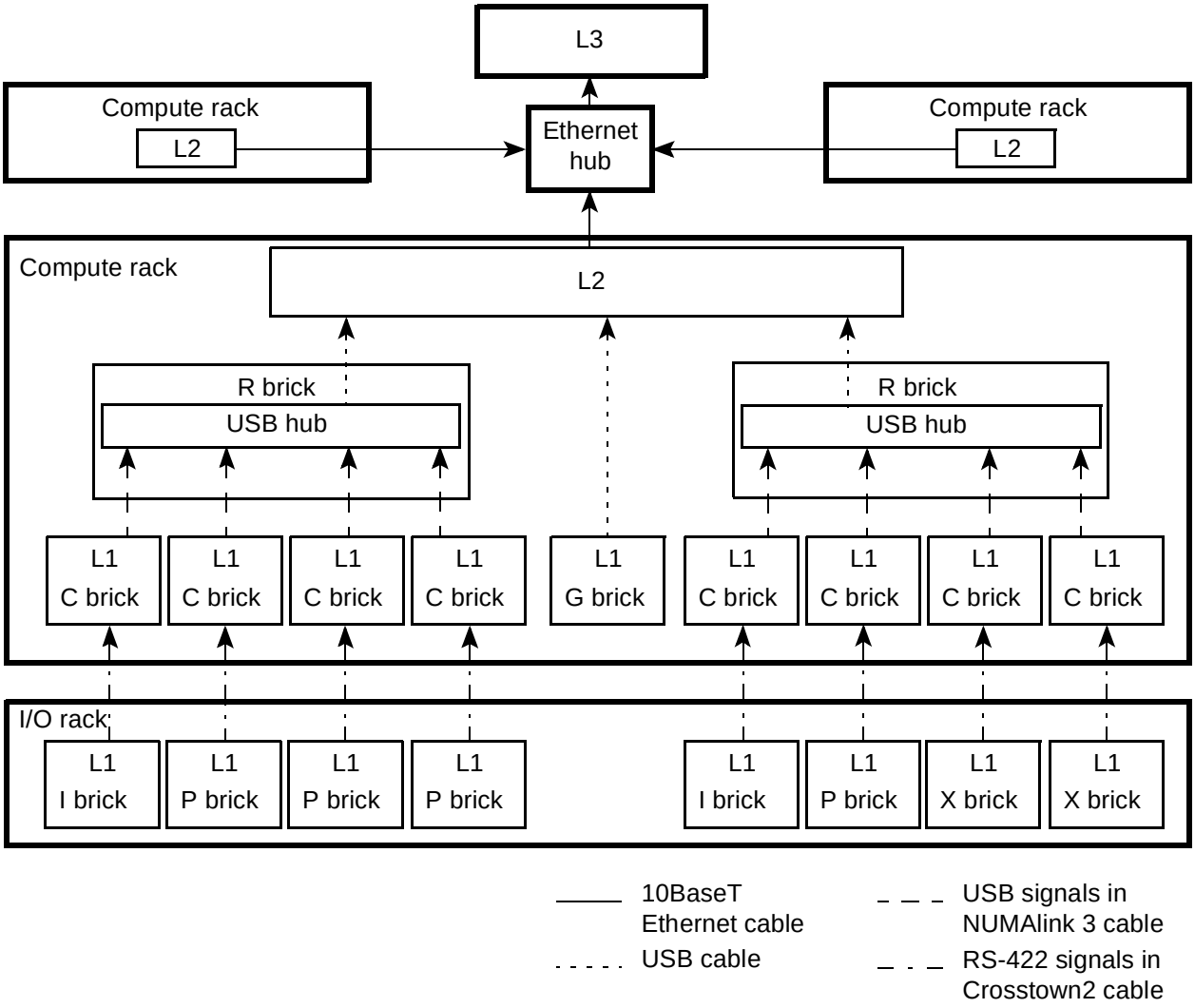



**Figure 4-2** System Controller Connections

### 4.1.2 FRUs

The L1 controller has the following FRUs:

- Display cable
- Display printed circuit assembly (PCA)

## 4.2 L2 Controller

The L2 controller is a rack-level controller; it is a single-board computer that runs an embedded operating system out of flash memory. The L2 controller is required for remote maintenance.

### 4.2.1 Components

The L2 controller consists of:

- Rack display
- L2 controller PCA

#### 4.2.1.1 Rack Display

The rack display is a 320 x 240 LCD with a touchscreen. It is located on the front of the cabinet and is visible when the door is closed.

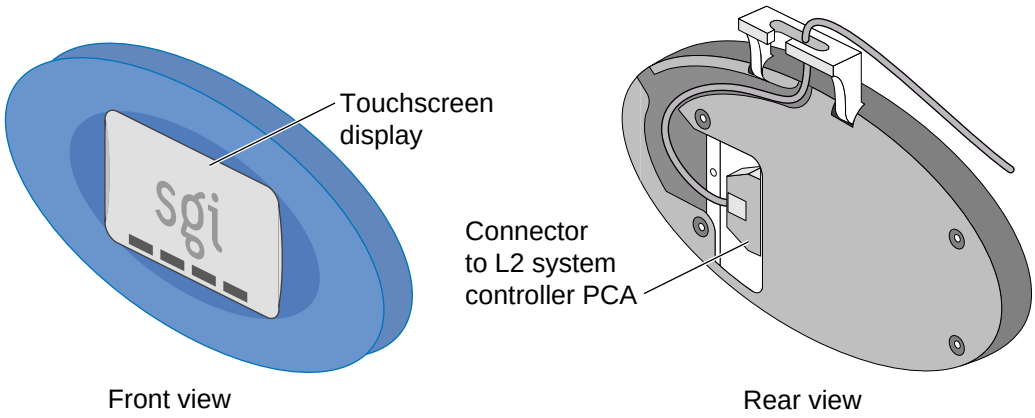



**Figure 4-3** Rack Display

#### 4.2.1.2 L2 Controller PCA

The L2 controller PCA is housed in a sheet metal box that is 1 U high and is located at the top of the rear of the rack (refer to Figure 4-4).

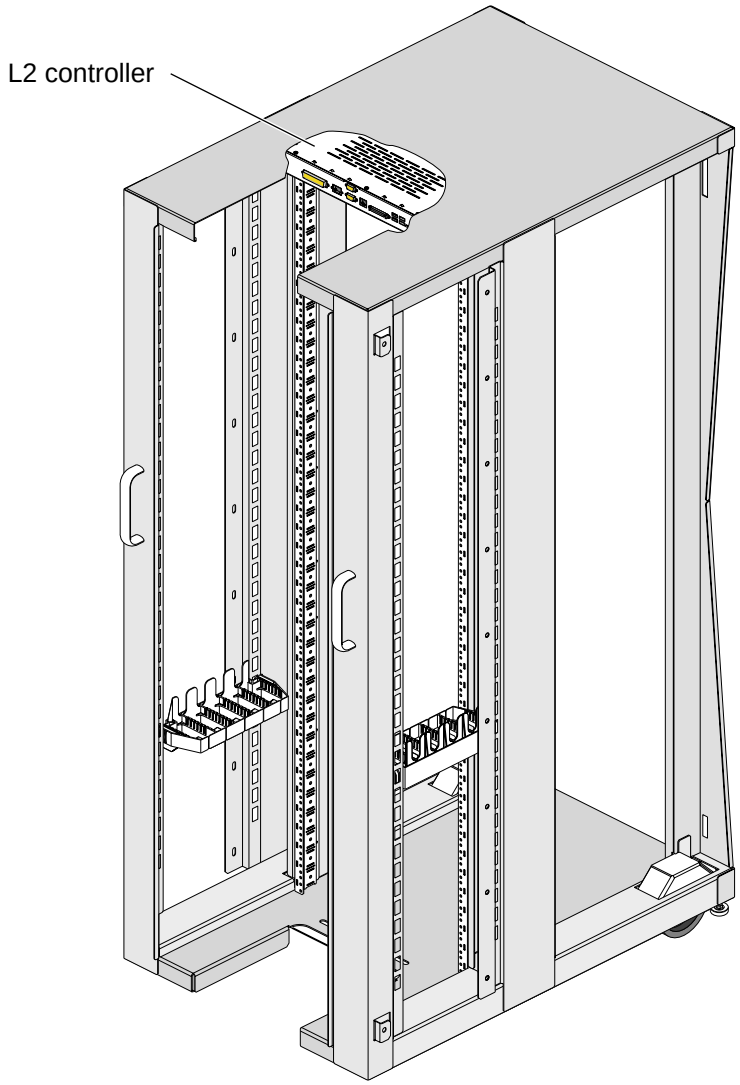



**Figure 4-4** Location of the L2 Controller within a Rack

The L2 controller PCA has the following connectors:

- Power connector - Connects to a power bay
- RS-485 connector - Not used
- Two RS-232 ports (DB-9) - Connect to the console and modem
- 10BaseT Ethernet port - Connects to an Ethernet hub
- Rack display port - Connects the rack display and the L2 controller PCA
- Four USB ports - Connect to the R bricks, the G bricks, and to the C bricks when the system does not have an R brick

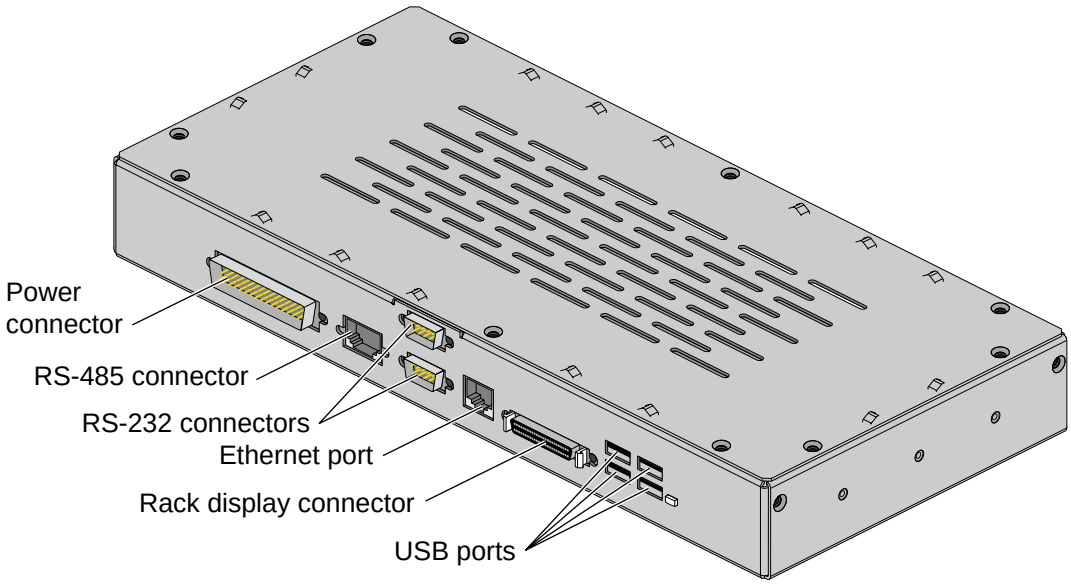



**Figure 4-5** L2 Controller Connectors

### 4.2.2 FRUs

The L2 controller has the following FRUs:

- Display panel assembly
- L2 controller assembly
- Cable assemblies

## 4.3 L3 Controller

The L3 controller is a system-level controller. It is a Linux software package that resides on a Silicon Graphics 230 visual workstation (refer to Figure 4-6). The workstation connects to one of two types of components: an Ethernet hub or a C brick.

The Silicon Graphics 230 visual workstation connects to the Ethernet hub through an Ethernet connector that is provided on the workstation. The Ethernet hub provides connections to the L2 controllers in the system.

The 230 connects to a C brick through a USB connector that is provided on the workstation. This configuration is used for small systems that do not have an R brick or an L2 controller.

### 4.3.1 Components

The Silicon Graphics 230 visual workstation has the following hardware characteristics.

- A system board that has the following major components:
  - A processor socket that seats a Pentium III processor
  - A VIA Apollo Pro 133A chipset
  - An onboard 10/100 Mb/s Intel 82559 LAN (local area network) chip
  - Three DIMM sockets that accept 64-, 128-, 256-, and 512-Mbyte SDRAMs

    **Note:** The maximum memory capacity is 1.5 Gbyte.
  - One AGP (accelerated graphics port) bus and five PCI bus slots
  - A system clock/calendar with battery backup
  - An IDE (intelligent drive electronics) hard disk and diskette interfaces
  - External ports:

| | |
|---|---|
| USB connectors | Serial ports 1 and 2 |
| Keyboard port | Speaker-out/Audio-out port |
| Mouse port | Audio-in port |
| Ethernet port | Microphone-in port |
| Parallel port | |

- Three 5.25-inch drive bays; the top drive bay contains the CD-ROM drive
- Four 3.5-inch drive bays; one of the 3.5-inch drives is a floppy drive
- Fans that cool the workstation
- A power supply that converts AC power to DC voltages

  **Note:** A switch allows you to select 110 Vac or 220 Vac for the input power.

For more information about the 230, refer to the *Silicon Graphics 230 Visual Workstation User's Guide*, publication number 007-4263-001.

### 4.3.2 FRUs

The Silicon Graphics 230 visual workstation has the following FRUs:

- 5.25-inch drives
- 3.5-inch drives
- A power supply
- Fans
- Expansion cards
- A system board
- An I/O panel gasket
- DIMMs
- A processor

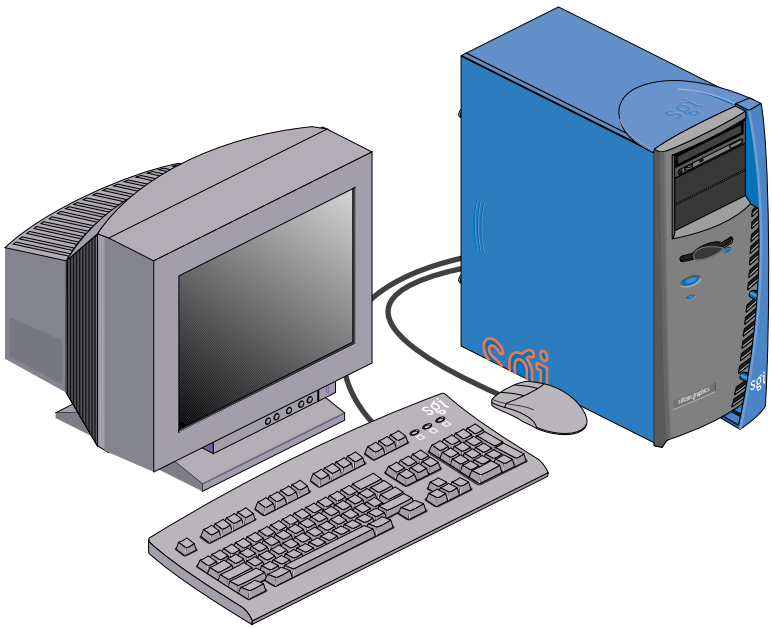


**Figure 4-6** Silicon Graphics 230 Visual Workstation

*Chapter 5*

# Ethernet Hub

**Note:** For information that applies to both the SGI Origin 3000 and SGI SNIA 3000 series servers, the name 3000 series servers is used throughout this document.

All 3000 series servers that have more than one compute rack require one to three Ethernet hubs to connect the L2 controllers together and to connect the L2 controllers to the L3 controller. Systems that have more than 32 processors, but less than or equal to 128 processors require one Ethernet hub. Systems that have more than 128 processors, but less than or equal to 256 processors require two Ethernet hubs. Systems that have more than 256 processors require three Ethernet hubs.

In an Origin 3800 or SNIA 3800 server, the Ethernet hub resides on a utility shelf in location U38 of the first compute rack. If the system contains multiple Ethernet hubs (for example, a 512-processor system uses three Ethernet hubs), the first Ethernet hub is located in Rack 001. The second Ethernet hub is located in Rack 011. The third Ethernet hub is located in Rack 008.

**Note:** For Origin 3200, Origin 3400, SNIA 3200, and SNIA 3400 servers, site planning determines where the Ethernet hubs reside.

The Ethernet hub has the specifications that are listed in Table 5-1.

**Table 5-1** Ethernet Hub Specifications

| Characteristic | Specification |
|---|---|
| Height | 1.4 in. (35.56 mm) |
| Width | 9.0 in. (228.60 mm) |
| Depth | 5.3 in. (134.62 mm) |
| Weight | 1.1 lbs (0.50 kg) |

The Ethernet hub has eight RJ-45 ports (refer to Figure 5-1). The controllers connect to the Ethernet hub via these ports (refer to Figure 5-2).

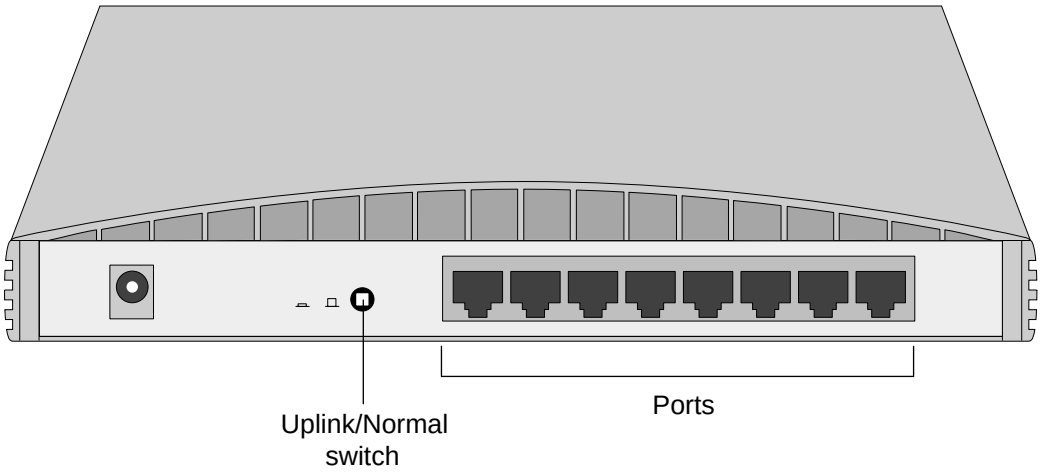
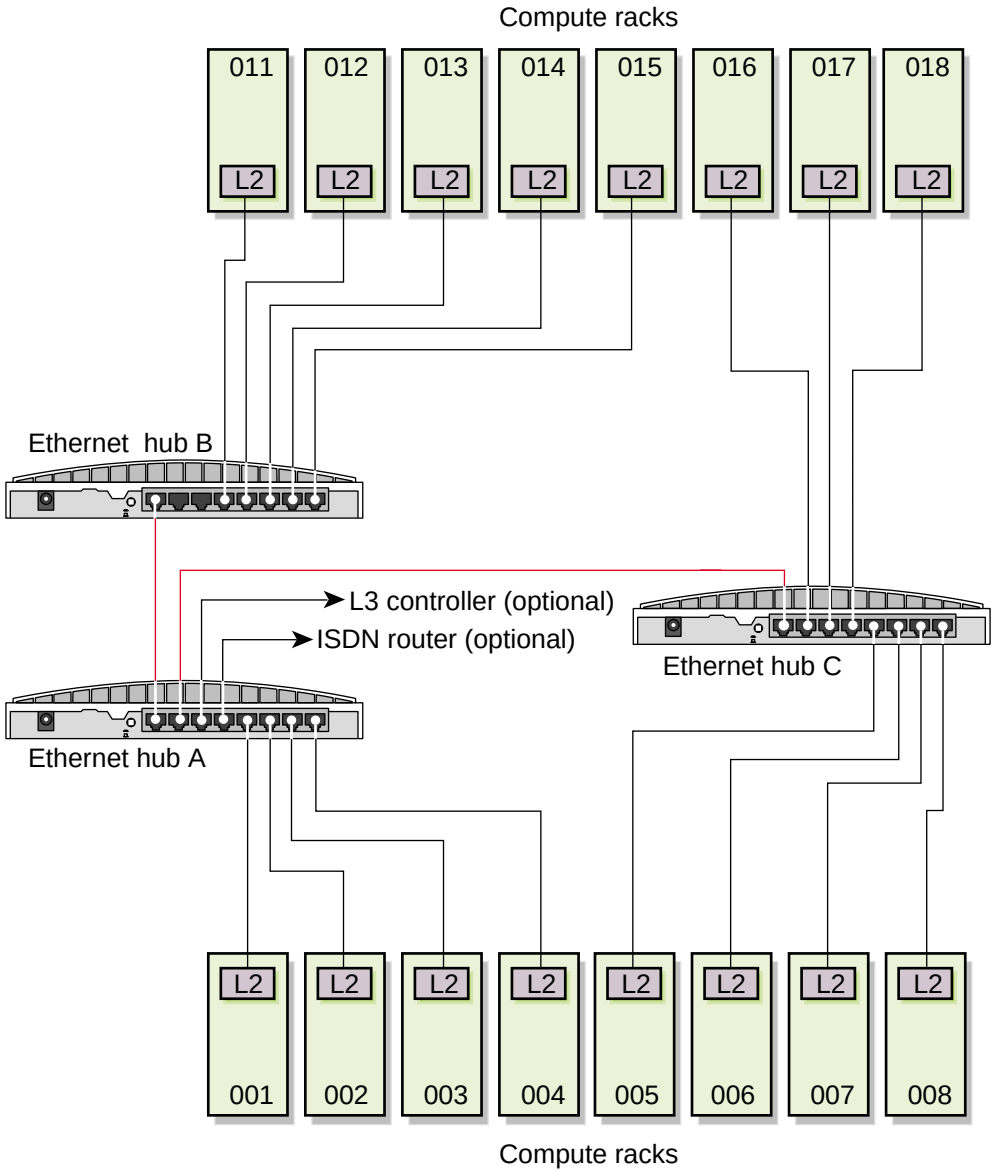



**Figure 5-1** Ethernet Hub




**Note:** Ethernet hub A is located in Rack 001.
Ethernet hub B is located in Rack 011.
Ethernet hub C is located in Rack 008.

**Figure 5-2** Multiple-hub Network in a 512-processor System

*Chapter 6*

# Cisco Router

**Note:** For information that applies to both the SGI Origin 3000 and SGI SNIA 3000 series servers, the name 3000 series servers is used throughout this document.

The 3000 series servers can be maintained remotely; the system connects to a remote location via a Cisco router and an Integrated Services Digital Network (ISDN) line or a modem and a telephone line. The Cisco router / ISDN line is the primary method; however, if the ISDN line is not available, the 3000 series servers can use the modem / telephone line method.

The Cisco router has the specifications that are listed in Table 6-1.

**Table 6-1** Cisco Router Specifications

| Characteristic | Specification |
|---|---|
| Height | 2.0 in. (5.1 cm) |
| Width | 9.7 in. (24.6 cm) |
| Depth | 8.3 in. (21.1 cm) |
| Weight | 1.45 lbs (0.66 kg) |

The Cisco router has eight ports (refer to Table 6-2 and Figure 6-1).

**Table 6-2** Cisco Router Ports

| Port(s) | Description |
|---|---|
| Four Ethernet ports | Provide connections to 10BaseT (10 Mbps) Ethernet networks. Compatible with 10/100-Mbps devices. |
| One console port | Provides a connection to the ISDN U interface. |
| One ISDN port | Provides a connection to a terminal or PC for software configuration and troubleshooting. |
| Two telephone ports | Provide connections to a telephone, fax machine, or modem, which are connected to telephone services through an ISDN line. |

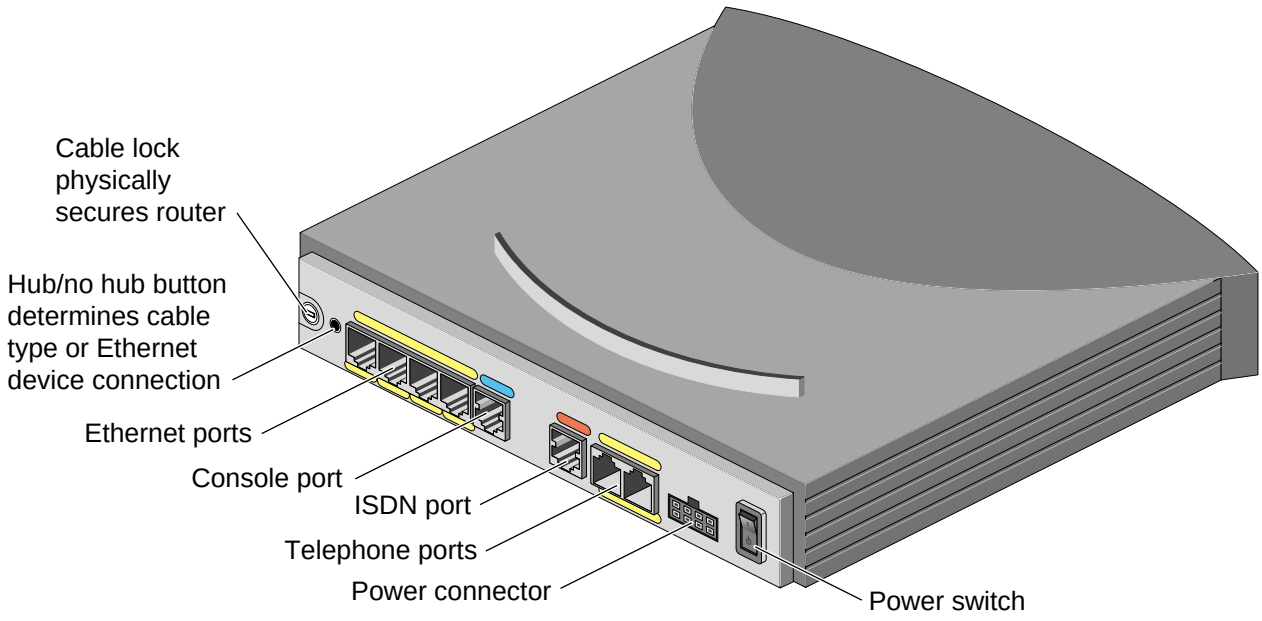



**Figure 6-1** Rear View of the Cisco Router

*Chapter 7*

# Cables

**Note:** For information that applies to both the SGI Origin 3000 and SGI SNIA 3000 series servers, the name 3000 series servers is used throughout this document.

The 3000 series servers use the cables that are listed in Table 7-1. Figure 7-1 illustrates the NUMAlink 3, Crosstown2, and Fibre Channel connections. Figure 7-2 illustrates the L1, L2, and L3 controller connections.

**Table 7-1** Cables

| Cable | Connection |
|---|---|
| Crosstown2 cable | Connects an Origin 3000 series C brick to an I, P, or X brick<br>Connects an SNIA 3000 series C brick to an I or P brick<br>Connects a G brick to an I or X brick |
| NUMAlink 3 cable | Connects a C brick to an R brick<br>Connects two R bricks<br>Connects two C bricks (when there is no R brick in the system) |
| USB cable | Connects an R brick to the L2 controller<br>Connects a G brick to the L2 controller |
| SSI DC power cable | Connects the power bay to a brick |
| Fibre Channel cable | Connects an I or P brick to a D brick |
| 10/100BaseT Ethernet cable | Connects the L2 controller to an Ethernet hub, another L2 controller, or an L3 controller<br>Connects the Ethernet hub to the L3 controller |

The NUMAlink 3 and Crosstown2 connections use the same physical cables. These cables have four different lengths; however, the NUMAlink 3 connections are limited to 3 meters. The Crosstown2 connections can extend to 4 meters.

- The 1-meter cable is used for connections within a rack.
- The 2-meter cable is used for connections between adjacent racks.
- The 3-meter cable is used for connections between racks that are two or more racks away from each other and for MetaRouter and repeat router connections.
- The 4-meter cable is used for Crosstown2 connections between racks that are two or more racks away from each other.

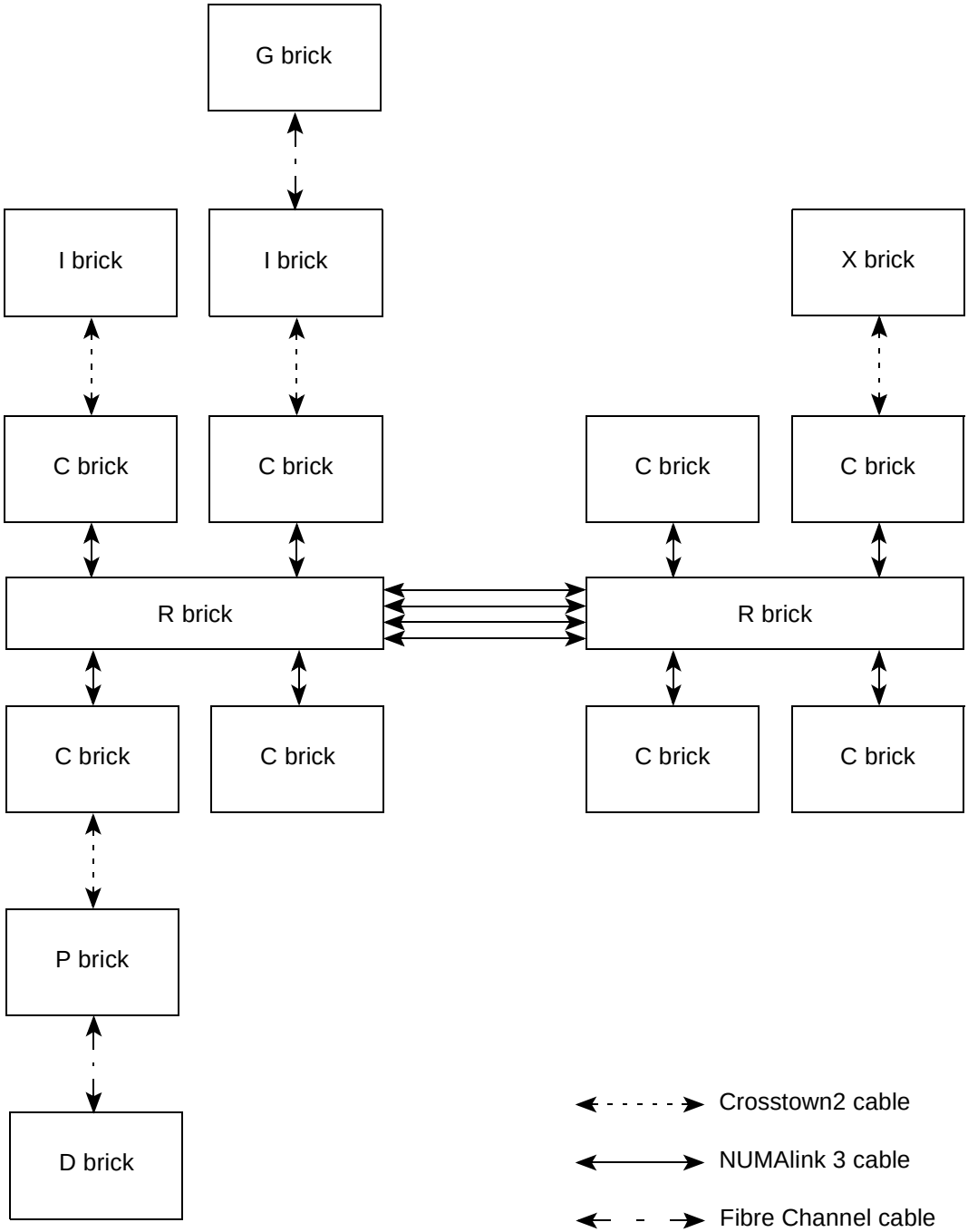
The NUMAlink 3 and Crosstown2 cables consist of 100 wires in shielded differential twisted pairs. The inputs reverse at the outputs. For example, pins 5 and 6 connect to pins 96 and 95 respectively at the other end.

The NUMAlink 3 and Crosstown2 cables carry Remote_Power_OK and Local_Power_OK signals that the USB hub and Xbridge ASICs monitor. If an ASIC detects a failure at the other end of the cable, it shuts down the port. These signals are also read and set by the L1 controller.

Pins 5, 6, 95, and 96 of the NUMAlink 3 cables transfer USB signals between the C brick and the R brick. When the NUMAlink 3 cable connects two R bricks, the R bricks ignore the USB signals.

Pins 5, 6, 95, and 96 of the Crosstown2 cables transfer RS-422 signals between the I/O bricks and the C bricks. RS-422 is a differential version of the RS-232; it has differential transmit and receive wires.

The USB cable transfers a host-based high-speed serial protocol with a 12 Mbyte/s bandwidth. This protocol has a tiered topology; one host, the L2 controller, has several hubs and slave devices (L1 controllers). The USB cable has four wires: two differential wires for data, one wire for power, and one wire for ground. The 3000 series servers use only the data wires.




**Note:** The SGI SNIA 3000 series server does not support the X or G brick.

**Figure 7-1** Crosstown2, NUMAlink 3, and Fibre Channel Cable Connections

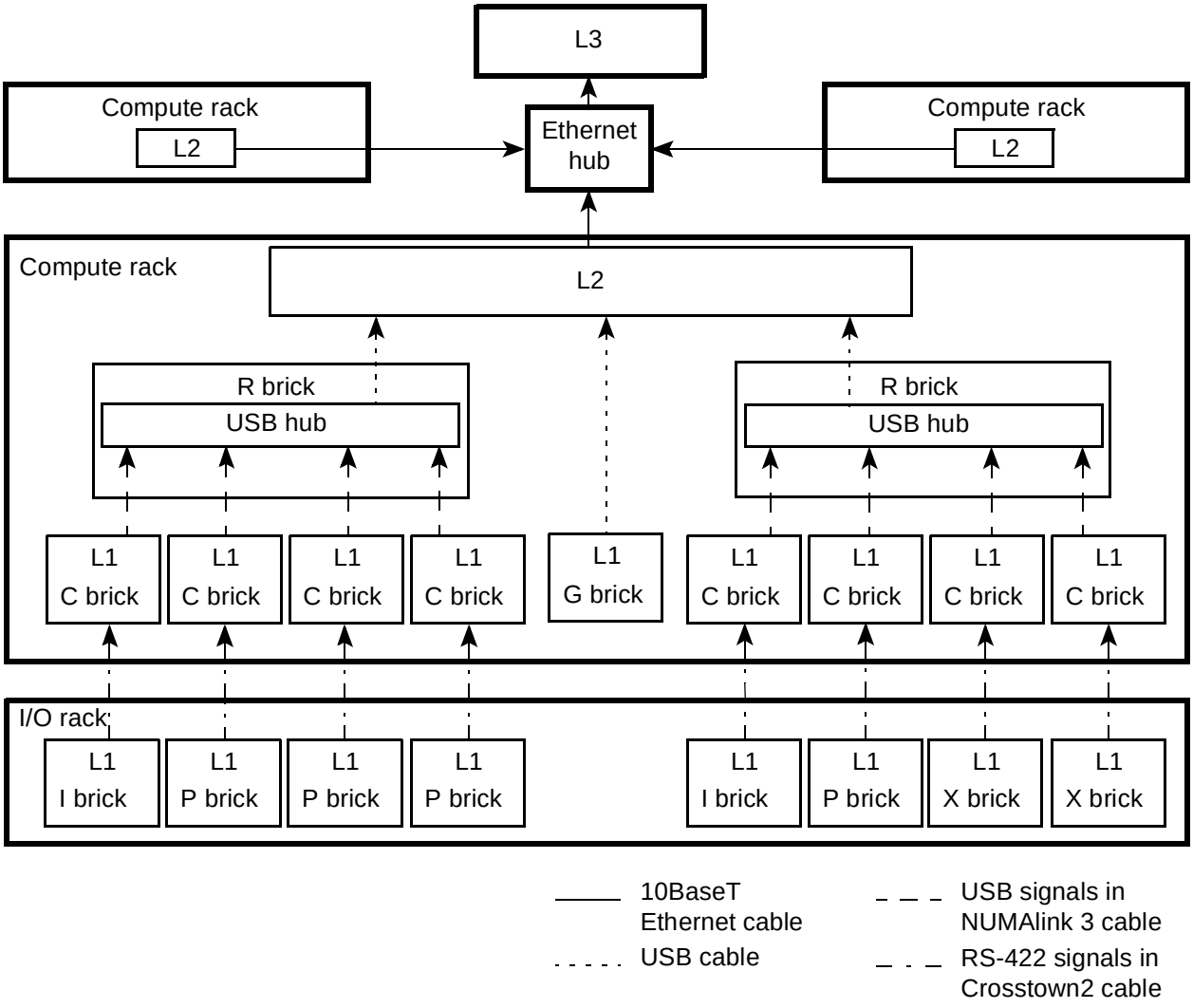



**Figure 7-2** System Controller Cable Connections

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